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THE NEW WONDER WORLD

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IN ELEVEN VOLUMES

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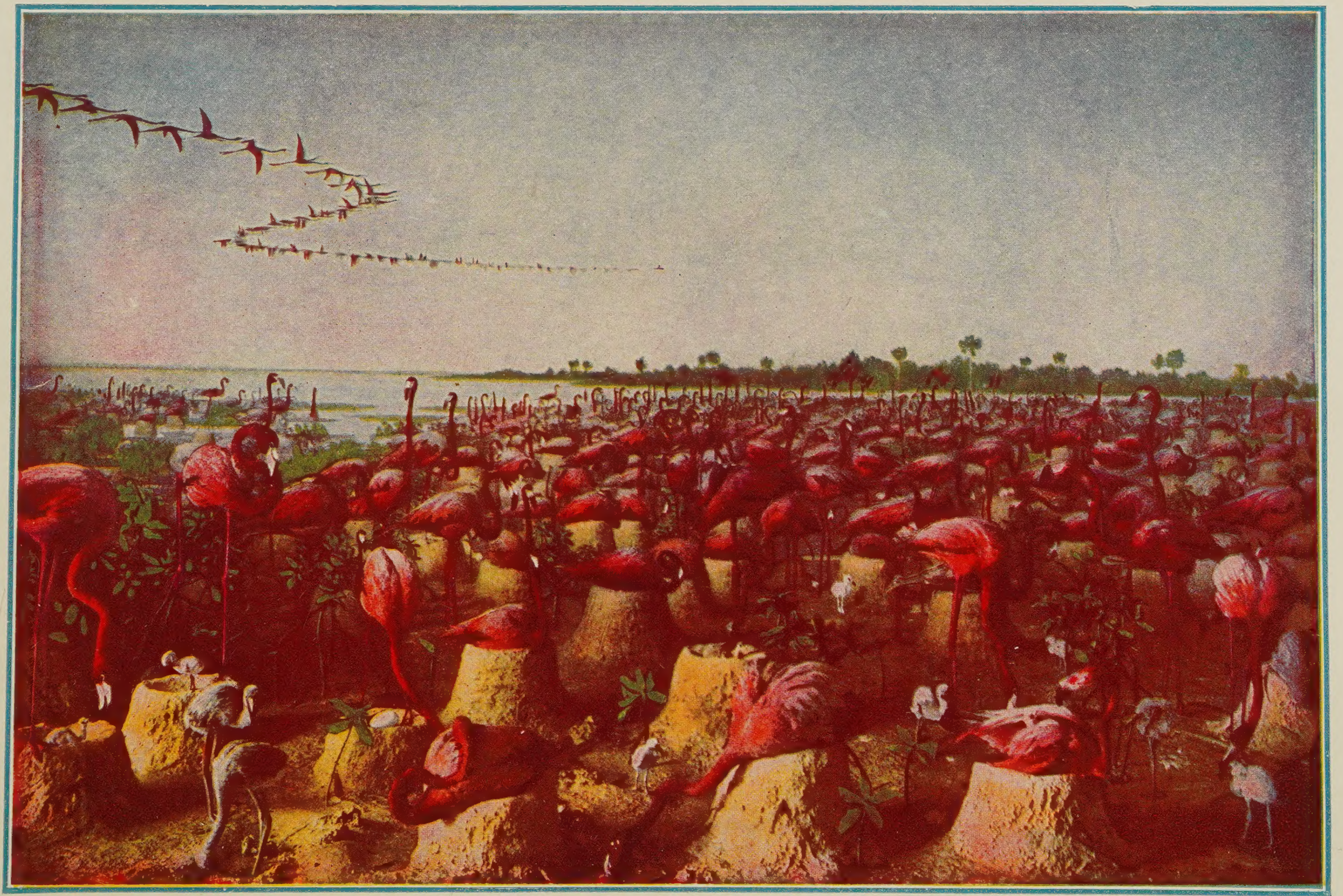

AMERICAN FLAMINGO COLONY FROM THE BAHAMAS

Habitat group in American Museum of Natural History, New York.

THE NEW
WONDER WORLD

A Library of Knowledge

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CHICAGO

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Volume III

THE NATURE BOOK

> *Make the boy interested in natural history if you can; it is better than games. . . . I know you will keep him in the open air.*
>
> CAPTAIN SCOTT'S LAST LETTER TO HIS WIFE

EDITOR'S INTRODUCTION

IF I had had such a book as this — or these — when I was a boy! When I was a boy? No, I am not going to find any fault with things as they were when I was a boy. We had great days then — great fishing, great skating, great swimming, great doings all the time. But books, especially books about the common things out-of-doors, were very few in my neighborhood. You will find me referring again and again in the pages of this volume to Gilbert White's "Natural History of Selborne." That was my first and only Nature book for years. Let me tell you how I came by that book. Somewhere, in "The Youth's Companion," perhaps, I read a short account of Gilbert White and his book. I immediately wanted to read the volume; but no one had a copy so far as I could find, and money for books was exceedingly scarce. But I wanted that "Natural History of Selborne," and when a boy of thirteen or fourteen wants anything — why, he does not weep about it and forget it — not when I was a boy, anyway. I wanted that book. I said nothing, but got a gunny sack, set off in the woods for "Horse Heaven," and carried out bones, bags and bags of bones, sold the bones to the rag-and-bone man, got thirty cents for those bones, and sent it to a publisher in Philadelphia to pay for my first book — "The Natural History of Selborne," in two volumes, for fifteen cents a volume. I have those two precious little books yet. There is not a picture in them. They were English too, and not American, but how I loved them!

I wish I could include in this great, splendid volume on American outdoor life a life-sized picture of my little "Natural History of Selborne," first, to show you, by way of contrast, how rich and full and suggestive a book you have in this. Of course, what makes Gilbert White's book great is its quaintness and charm of style. This book of yours is great because of its wealth of pictures — the publishers have spared no cost — and the number of its facts and suggestions for tramps afield and Nature study.

When I was a boy — we had few books, but what big fields we had! What deep, dark woods! What great, rainy-faced marshes! What beasts and birds, fish, frogs, and flowers to find out about! And I lived right out in the big fields in a little house, right on the edge of the woods too, and right near the marshes, and right in the middle of the sunshine by day and the dark by night, and right on the road of all the great storm winds that used to go by calling me, calling me; and when I did n't come, but hid my head under the covers, they would stop and seize the little house, and shake it, and scream, and go tearing on into the thick pine woods with a rush and a roar that carried me out of bed and off, far, far away to the edge of the world.

When I was a boy — I knew where to "snood" pike, where to get magnolias, where to pick huckleberries, where to trap muskrats, where to go for barred owls' nests and whip-poor-wills' and mud hens' and mallards' nests; for pitcher plants, and pixie, and —

What a wonderful boy I must have been — when I was a boy! No, forgive me, I did n't mean to brag, but simply to tell you how I loved the fields and woods, how glad I am now that my mother was wise enough to turn me loose in their wide spaces and quiet, shadowy depths, instead of making me swing on the front gate or sending me to see the "movies."

The fields and woods are the child's natural habitat. Birds and animals and flowers are his natural companions and playmates. Children want to know about animals long before they want to know about men; and they do know a kangaroo from a polar bear long before they know a Lincoln from a Washington.

Give the children, then, the great out-of-doors and someone to tramp with them, and some book or books to suggest to them what to see, and what it is that they have seen. It is my hope that this Nature Book may so help them. I have four small boys of my own who have helped me to write it. In spite of growing old, I have n't got past being a boy myself. I am so sorry that I did outgrow being a girl — years and years ago. But — I can remember when I wore dresses! So being a boy, and having four boys, and living here in the woods and fields on Mullein Hill, why should I not hope that this Nature Book may take you out-of-doors and keep you there the seasons through until you come to know the shy wild folk, the green fields, the snowy woods, the sweeping winds, the wakeful stars — keep you there, indeed, until you come to love this great round earth which is your home?

Dallas Lore Sharp

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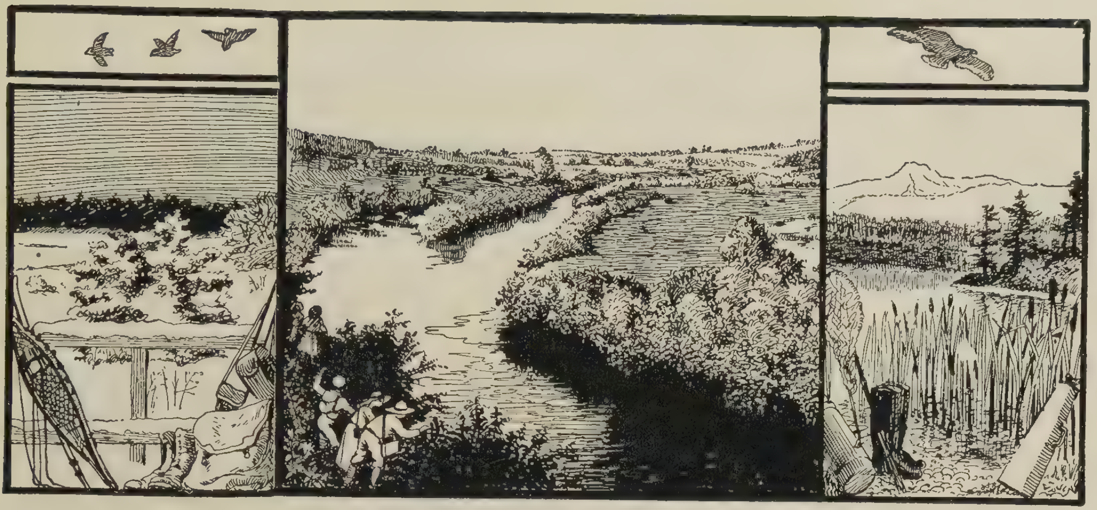
AUGUST BIRD-LIFE OF THE HACKENSACK MARSHES, NEW JERSEY

Bobolinks, Red-winged Blackbirds, Soras, Barn Swallows, Tree Swallows, and Wood Ducks.

Habitat group in American Museum of Natural History, New York.



TRAMPS AFIELD

FIELD TRAMPS AND TRAMPING

THE TRAMPER

A REAL Nature lover is a tramp; not the kind that walks railroad ties and follows the highways from city to city, but one who tramps the fields, early and late, summer and winter, to breathe the fresh, clean air, to smell the sweet fragrance of the woods, to see the clouds and the stars, to watch the ways of the wild things that live, from the tree top to the deepest burrow underground.

Don't try to tell anybody, least of all yourself, that you love the out-of-doors, unless you have your own path to the woods, your own crosscut to the pond, your own particular huckleberry patch and fishing hole and nut trees. You do not love the birds and beasts and flowers unless you love them well enough to take a day now and then for a tramp through the fields.

WALKING

You thought you learned to walk soon after you got out of the cradle, and perhaps you did, but most people know only how to hobble along on their feet. First you must be a good walker, so good that you will enjoy a ten-mile jaunt as you do a dip in the sea on a July day. You must have good feet and go well shod — not in pumps or patent-leather shoes, nor yet in your bare feet.

Wear stout, well-fitting shoes, broad in the toe and heel; light, stout clothes that won't catch in the briers, and with your bird glasses start out, not forgetting a bite of lunch.

Swing along now with your *legs*, not on all fours, as if you might have a tail and live in a tree. Breathe to the bottom of your lungs; balance your body on your hips; go leisurely but not slow, for walking is not crawling and crawling is deadly tiresome and dull.

When you can do ten miles through the brush and up a mountain side, or over a marsh, and feel just as if you would love to eat up ten miles more, then you can call yourself a walker and are ready for the fields.

YOUR WALKING KIT

First, a good stout stick; second, a pair of field glasses for bird and animal watching; third, a botany can slung over your shoulder to carry home anything you may wish to bring, from Mayflowers to February fish; fourth, a notebook in your pocket in which to jot down things as you see and hear them — and sometimes things as you think them.

This is all you need and more than you need for every tramp. Still, I must not forget to add the string and pocketknife, and later on

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YELLOW WARBLER'S NEST

the camera. I have been afield all my life and never owned a camera or used one. But if you have one or think you would like one, don't fail to make use of it in your outdoor watching and study. I shall have more to say of the camera in another chapter.

WHERE TO GO

You do not start for the city, if you live in the suburbs, or from the city to the country, without having some errand to do, somewhere to go, and something to get or do. Neither ought you to start for the fields without something definite in your plans — some spot to visit, or bird's nest to see, some flower to get, some particular path to follow for some definite purpose.

Now anything that takes you into the fields and woods is good — plowing, hoeing, chopping, fishing, berrying; but aside from these reasons you should have certain places that you visit often and just because you wish to get acquainted with the wild folk who dwell there.

So you should choose a wood lot or a pasture slope or a long, winding farm lane, or any such haunt as you can visit often and easily and come to know thoroughly.

Don't be afraid of discovering everything in it at once. There are fifty-two weeks in the year, every week bringing different weather, every change of weather bringing different birds or animals or plants — February the hoot owls; April the screech owls; November the snowy owls; June the bobolink in his wedding dress of black and buff; September the bobolink in his traveling clothes of plain brown, ready for his long journey to the rice fields of the Carolinas.

WHAT YOU MIGHT FIND IN YOUR HAUNT

BIRDS

There might be in this walk of yours, if it includes an orchard and a pond and a wood lot, as many as sixty species of birds building nests — more than you could come to know intimately in half a dozen summers.

Then, in the spring and autumn, when the migrating birds are passing, there might be fifty species more. I have a friend who has seen one hundred and fourteen species of wild birds in his haunt, which is Lincoln Park, Chicago. He went out morning after morning for six springs — as you will have to do before

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SUMMER ROADS WHICH INVITE THE EXPLORER

you find all the birds that nest or visit your park, whatever that park may be.

BEASTS

The wild animals you will find depend so very much upon where you live, I mean whether near the city or in a city, or north or south, that it is hard to say just what you possibly may find in your tramp afield. Certainly not a wild buffalo or a polar bear, or a Bengal tiger. Yet here am I near to the city of Boston with the foxes running through my dooryard nightly, with skunks and rabbits and even an occasional deer roaming abroad in the open daylight. Then count the three or four species of mice, the three species of squirrels, the mink and muskrat, the moles and weasels, and here are more than a dozen wild animals in fur living with me on my small farm.

REPTILES

You will have to go many times afield and think and watch long before you will care to call all the reptiles in your haunt your neighbors and friends. But by and by the turtles and salamanders and snakes and toads and frogs will be just as interesting to you as the birds, and you will watch them and note their ways with just as much interest and pleasure as you watch the other wild folk about you. It is a poor, shallow lover of Nature who jumps upon a little snake or who shivers when a salamander drops out of the leaf mold at his feet.

FISHES

Then the fishes — a dozen of them, too — you will find if a pond or brook lies within the limits of your familiar walk. A small scoop net as well as a fish line will be of real service to you in your watching of fish ways. The other day I was at a garden party in the grounds of the Andersons, near Boston, one of the richest estates in all New England, and I saw in the edge of the pond something more interesting to me than the rose garden or the Italian garden or the Japanese dwarf trees (and those were very interesting) — a whole colony of sunfish nests in the shallow margin of the water, each nest guarded by an old fish.

INSECTS

But I shall not name, or try even to count up, the butterflies, beetles, moths, bugs, wasps, bees, ticks, mites, and such small deer as you will find to study and collect in the round of your tramp. There are hundreds of them all told.

PLANTS

Nor shall I now stop over the flowers and trees. But do you suppose you can find mistletoe in your woods as I found in mine when I was a boy, or twelve species of wild native orchids as one of my friends and fellow-trampers has found in her small round between her home and the country schoolhouse where she teaches?

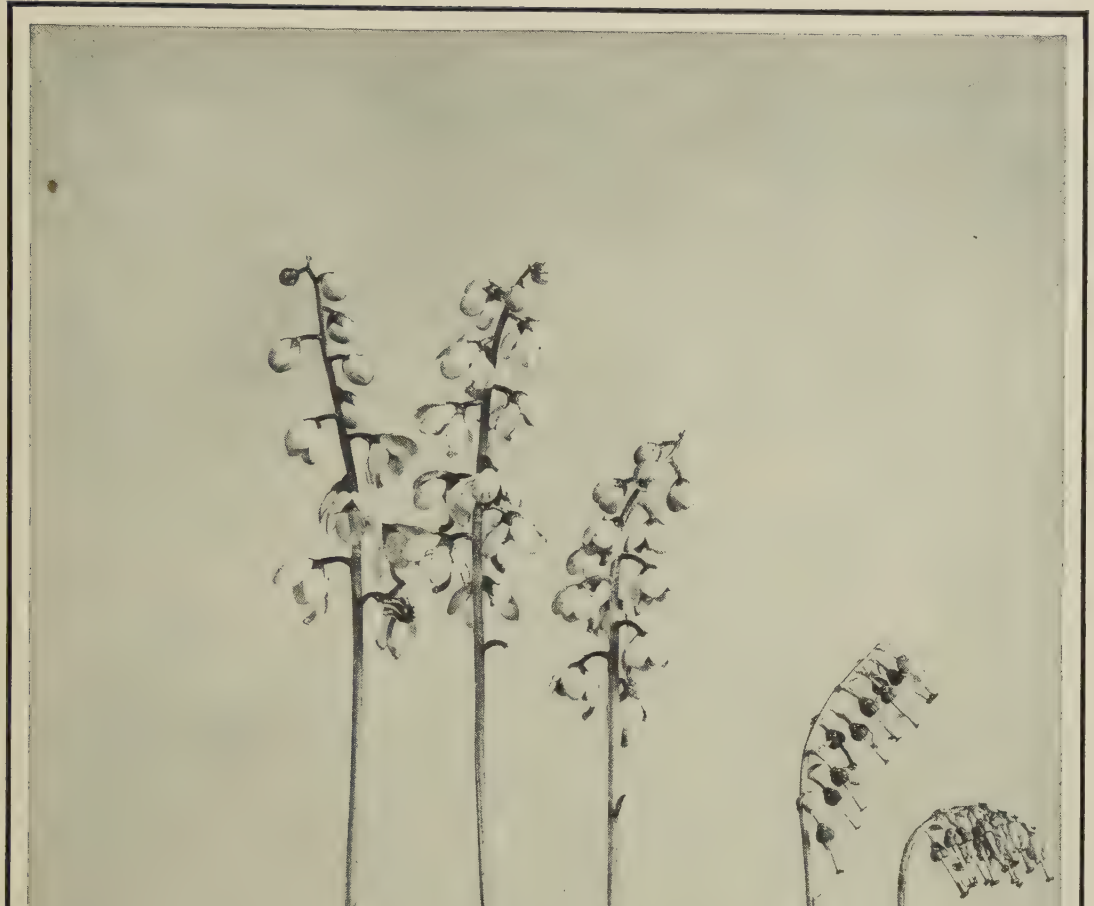
There are 522,400 species of living animals known upon the face of the earth. No matter how small a piece of that earth you take for your study and observation, you will find it so abundantly stocked with life that you will never be able to know intimately every bit of it.

HOW TO WATCH

The best way to become a watcher in the woods, one who knows a beetle from a bullfrog, is to begin your observations with some bird or animal and watch it until you know *many* things about it — if a bird, say, its color, shape, size, habits of flight; its various cries and calls and songs; its nest and feeding habits; its arrival in the spring, if it is a migrant, and its departure in the fall. And also the other birds of its family. If, for instance, it is the tree swallow you have taken, know what its characteristic swallow marks or lines are, and how it differs from the blue martin, the barn swallow, the cliff and eave swallows, and from the chimney swallow, which really is no swallow at all, but a swift, and more of a humming bird than a swallow.

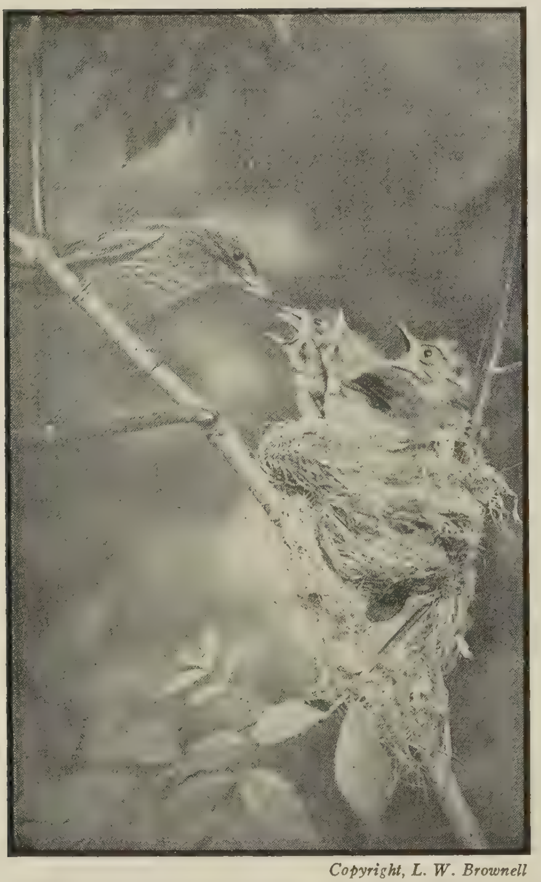
A TREE-STUMP WATCH TOWER

Or you may begin by choosing some spot to watch — a dell, a sunny bank, a batch of swamp, a waterfall. In that case choose a stump or a rock or some easy seat, and *sit*



A FRIEND OF THE WOODS, THE SHINLEAF

Left to right: One-flowered Pyrola (*Moneses uniflora*); Pyrola americana; Pyrola secunda, in fruit.



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YELLOW WARBLER FEEDING YOUNG

there with your eyes open, ears alert, and mind ready for all that comes along.

That will be hard work. Sitting still hard work? Oh, yes, it is very hard to sit still and keep from going to sleep or getting restless or finding things slow and stupid. It is a well-trained naturalist who can sit still.

Now from this stump or stone you will listen to the sounds about you — voices, wings, feet, and fins — until you can tell the whirl of a pike on the water from the splash of a mud turtle sliding off its log; and the hop-hop-hop of a rabbit from the seesaw scratch of a box turtle scuffing through the leaves.

Then you will distinguish the movements of things — the sway of a limb when a squirrel has dropped upon it from the jar caused by an alighting bird; the way the grass moves when a snake is gliding through it from the way it parts when a cat is working carefully along.

Then you will study the kinds of trees about you, their shapes, boles, and visitors; the shrubs and flowers, to know what insects come to them and what part they play in the life of the locality.

You won't be long in discovering, too, that such a lookout is the best possible place to see the wild things that are too shy and too frightened to venture into the open unless the woods are absolutely still. And they cannot be still when your two feet are stirring, for you are not a soft-footed wild thing. You tiptoe along and come very near to waking all the dead of the woods, to say nothing of the living wild things.

YOU MUST LEARN TO TAKE A HINT

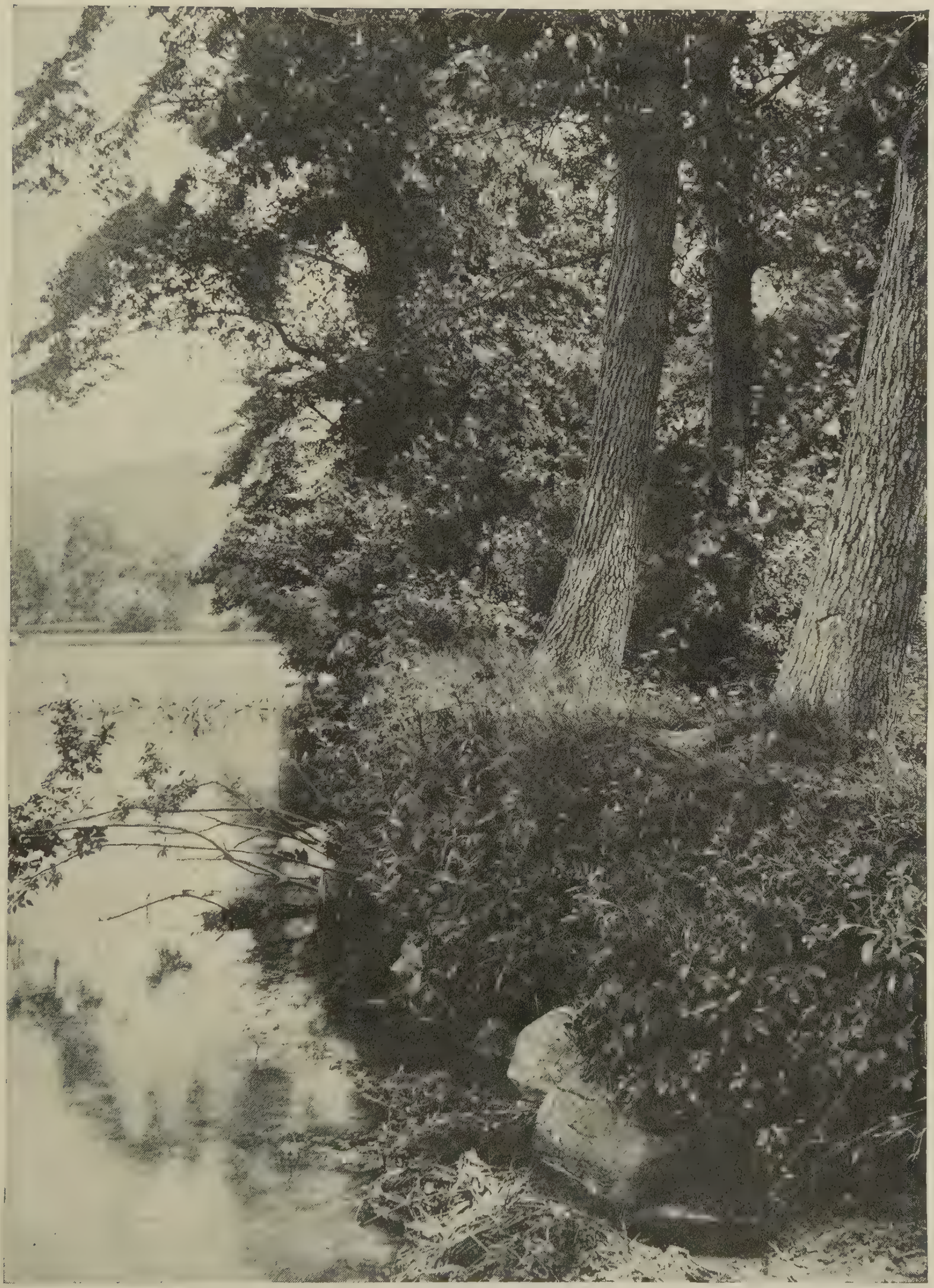
"A good observer is quick to take a hint and follow it up," says Mr. Burroughs. For instance: Some time ago I caught sight of a humming bird whirling round and round the big trunk of an oak tree, and this is what flashed through my mind quicker than lightning — "no flowers here — no insects — lichens here — she thatches her nest with lichens — she's building" — and by that time she had darted off and I had shot my eyes across the open space among the trees, intercepted her flight, and caught the bee-line direction of her nest.

Three seconds would cover all the time it took, but that was long enough to get the hint that led to the discovery of that rare little bunch of down and lichen on the horizontal limb of a sapling not far off in the woods.

All the slight motions of limbs and grass, all the tiny sounds of life, all the queer, unusual actions of familiar animals and birds, are hints. In fact, if you can't take a hint, if you are such a child in the woods that you have to be told that your mother wants you, you will never make a naturalist or get far with outdoor observation.

YOU MUST LEARN YOUR HAUNT INTIMATELY

I said a few lines back that you will find any field or wood lot, any place that you pick out for your rambles and watching, so well stocked



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A WATCH TOWER AND LISTENING POST

with live things that you will never come to know them all intimately. That is true, but it is also true that you need to know the locality intimately — its hills and hollows, streams and ponds, trees and cow paths, etc. And, no matter how intimately acquainted you become, it is true again that the region will never grow dull to you.

A NATURALIST'S RAMBLES ABOUT HOME

Do you know Dr. C. C. Abbott's books, especially his "Naturalists' Rambles about Home"? This is what Dr. Abbott says of his flat, commonplace country in New Jersey where he takes his outdoor tramps:

"If one could take an airy, bird's-eye view of this level country, he would see, more prominently than all other features, save one, a sinuous, leafy serpent, miles in length, with gaping jaws, upon the shore of the river, and a delicate, threadlike tail, afar in the outstretched fields. It is the valley of a near-by creek.

"One has nowhere more than a few rods to walk back from the stream to find either fields, gardens, or the public road; but such a walk! It is a wilderness that wooes the birds; it is a wild wood that protects the beast; it is the haunt of many a creeping thing, squat toad, sleek frog, and slippery salamander. Much as has been written of it, far more remains well worthy of recording. Or, looking northward, one traces from the distant mountains trending toward the sea the more pretentious valley of the river. Here I have found a new country, teeming with delights. Its wreck-strewn shores, its sandy beaches which the tide lays bare, its wild and wasting islands and open reaches of wind-troubled waters, have alike held me as the days rolled by. And so it happens that, after many a ramble in far-off regions, where rocks, lakes, rivers, and boundless pine barrens offered endless novelty, it was ever a pleasure to return to the unpretending creek and modest river, and spend my days with 'old familiar faces.'

"Not only the

> "'ragged cliff
> Has thousand faces in a thousand hours,'

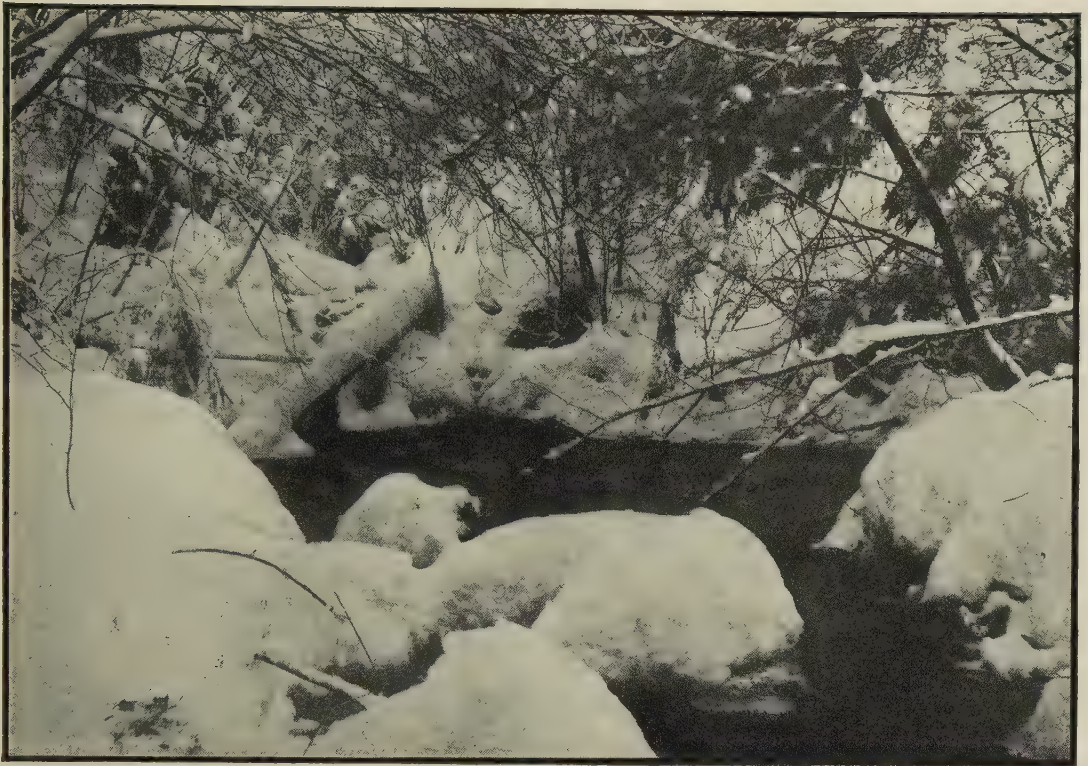
but this I find true of the tamest pasture, where not even the clover and buttercups of one side are the twins of the buttercups and clover of the other; and think of the bees, birds, beetles, and butterflies that come and go! These, I know, are not the same, yesterday, to-day, and forever.

"Whether it be the crested tit defying the chilliest blast of January; violets mantling the meadow banks in April; thrushes singing their farewell summer songs, or dull and dreary dim December days — it matters not, they never repeat themselves, or else I am daily a new creature. Nor sight nor sound but has the freshness of novelty, and one rambler, at least, in his maturer years is still a boy at heart."

THE GOOD NATURALIST

That is what a real lover and watcher of the woods says after years and years of tramping over the same flat and, to the unknowing, monotonous farm and meadow land about his home.

The better you know your woods, the more you will find in them and the more you will love them. "He is a thoroughly good naturalist who knows his own parish thoroughly." Do you know your parish thoroughly?



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THE BROOK AFTER THE FIRST SNOWFALL

HUNTING THE SNOW[1]

AS an illustration of the spirit and method of the Nature study that I would have you do, let me take you, together with my four boys, upon a winter tramp. We are going to hunt the snow. That is, we are going on this tramp to see what tracks of birds and animals we can find, and, more than that, what the tracks themselves may tell us of the animal's doings or feelings at the time he left them in the snow.

YOU WANT NO GUN

You want no gun, no club, no game bag, no steel trap, no snare, when you go hunting the snow. Rubber boots or overshoes, a good stout stick to help you up the ridges, a pair of field glasses and a keen eye, are all you need for this hunt, besides, of course, the snow and the open country.

You have shoveled the first snow of the winter; you have been snowballing in it; you have coasted on it, and gone sleigh riding over it; but unless you have gone hunting over it you have missed the rarest, best sport that the first snowfall can bring you.

WHAT IS THE BEST DAY OUT-OF-DOORS?

Of all the days to be out in the woods, the day that follows the first snowfall is — the best? No, not the best. For there is the day in April when you go after arbutus. And there is the day in June when the turtles come out to lay in the sand; the muggy, cloudy day in August when the perch are hungry for you in the creek; the hazy Indian Summer day when the chestnuts are dropping for you in the pastures; the keen, crisp February day when the ice spreads glassy clear and smooth for you over the mill pond; the muddy, raw, half-thawed, half-lighted, drowned March day when the pussy willows are breaking and the first spring frogs are piping to you from the meadow. Then there is — every day, every one of the three hundred and sixty-five days, each of them best days to be out in the live world of the fields and woods.

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[1] From "Winter," by Dallas Lore Sharp. By permission of Houghton Mifflin Company.

But one of the very best days to be out in the woods is the day that follows the first winter snowfall, for that is the day when you must shoulder a good stout stick and go gunning. Gunning with a stick? Yes, with a stick, and rubber boots, and bird glasses. Along with this outfit you might take a small jointed foot rule with which to measure your quarry, and a notebook — to carry the game home in!

It ought to be the day after the first real snow, but not if that snow happens to be a blizzard and lies deep in dry, powdery drifts, for then you can hardly follow a trail if you should find one. Do not try the hunt, either, if the snow comes heavy and wet, for then the animals will stay in their dens until the snow melts, knowing, as they do, that the soft, slushy stuff will soon disappear.

THE IDEAL HUNTING SNOW

The snow you need will lie even and smooth, an inch or two deep, and will be just damp enough to pack into tight snowballs.

If, however, the early snows are not ideal, then wait until over an old crusted snow there falls a fresh layer about an inch deep. This may prove even better hunting, for by this time in the winter the animals and birds are quite used to snow walking, and besides, their stores of food are now running short, compelling them to venture forth whether or not they wish to go.

It was early in December that our first hunting snow came last year. We were ready for it, waiting for it, and when the winter sun broke over the ridge, we started the hunt at the hen-yard gate, where we saw tracks in the thin, new snow that led us up the ridge and along its narrow back to a hollow stump. Here the hunt began in earnest, since not until that trail of close, double, nail-pointed prints went under the stump were the four small boys convinced that we were tracking a skunk and not a cat.

WHAT THE TRACKS TOLD

The creature had moved leisurely — that you could tell by the closeness of the prints. Wide-apart tracks in the snow mean hurry. Now a cat, going as slowly as this creature went, would have put down her dainty feet almost in a single line and would have left round, cushion-marked holes in the snow, not triangular, nail-pointed prints like these. Cats do not venture into holes under stumps, either.

We had bagged our first quarry! No, no! We had not pulled that wood pussy out of his hole and put him into our game bag. We did not want to do that. We really carried no bag; and if we had, we should not have the wood pussy in it; for we were hunting tracks, not animals, and "bagging our quarry" meant trailing a creature to its den, or following its track until we had discovered something it had done, or what its business was, and why it was out. We were on the snow for animal *facts*, not animal pelts.

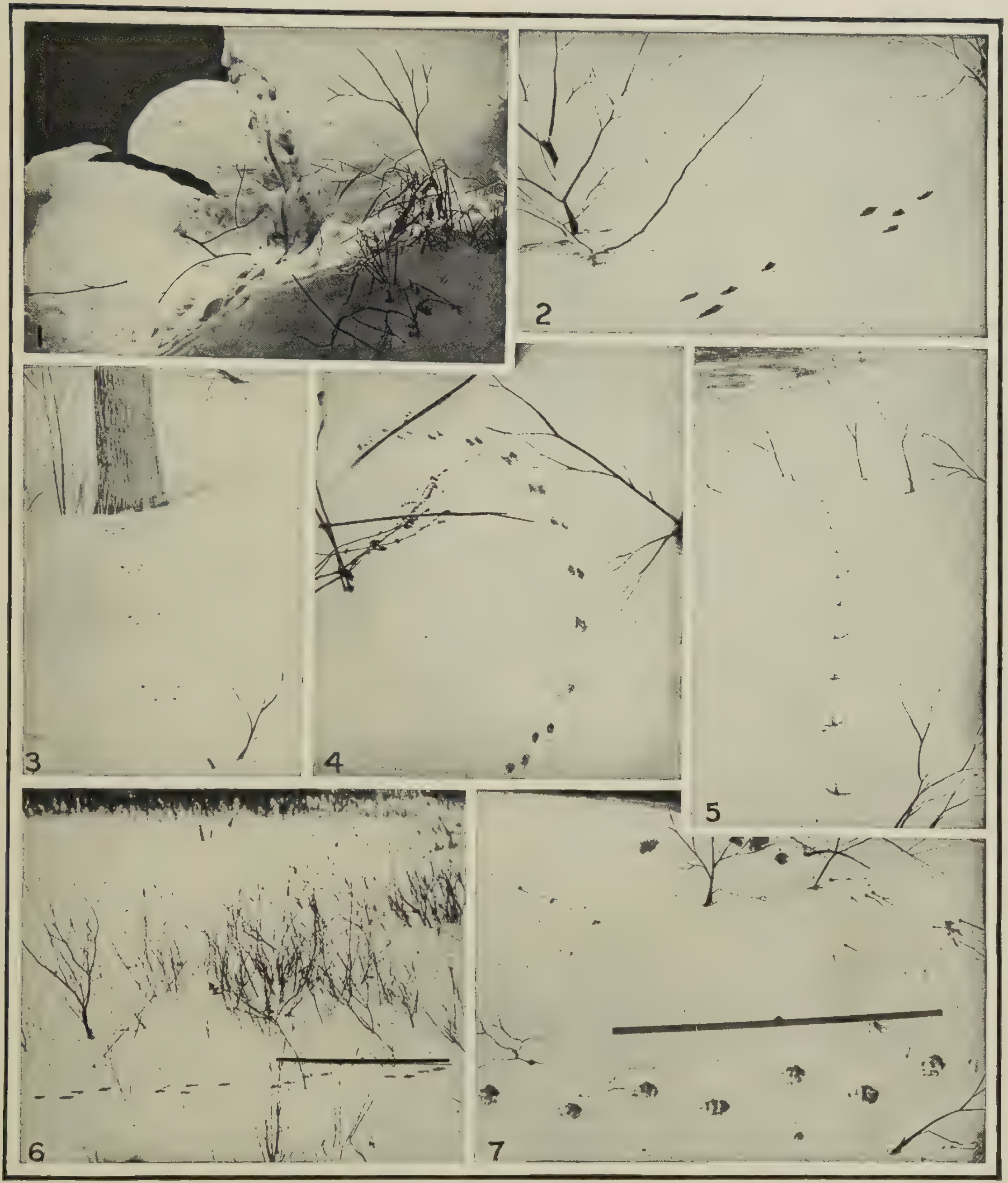
THE SECOND "KILL"

We were elated with our luck, for this stump was not five minutes by the steep ridge path from the hen yard. And here, standing on the stump, we were only sixty minutes away from Boston Common by the automobile, driving no faster than the law allows. So we were hunting, not in a wilderness, but just outside our dooryard and almost within the borders of a great city.

And that is the interesting fact of our morning hunt. No one but a lover of the woods and a careful walker on the snow would believe that here in the midst of hayfields, in sight of the smoke of city factories, so many of the original wild wood folk still live and travel their night paths undisturbed.

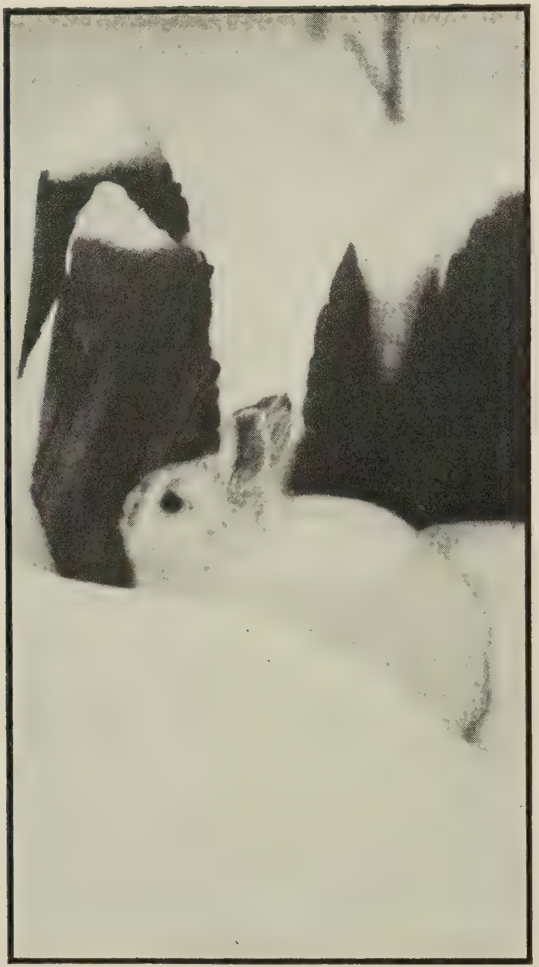
Still, this is a rather rough bit of country, broken, ledgy, bowlder-strewn, with swamps and woody hills that alternate with small towns and cultivated fields for many miles around.

Here they are still at home, as this hole of the skunk's under the stump proved. But there was more proof. As we topped the ridge on the trail of the skunk, we crossed another trail, made up of bunches of four prints — two long



TRACKS IN THE SNOW

1. Where the muskrat wandered from the brook. 2. Rabbit's tracks: Bunny jumps in leapfrog fashion, his two wide-apart hind feet in front. 3. The squirrel's track goes from tree to tree. 4. The tiny trail of the short-tailed shrew. 5. The crow's track by the meadow edge. 6. Skunk running: he puts all four feet down at once. 7. Skunk walking: he walks with his feet wide apart.



Mus. of Nat. Hist., U. of Minn.

VARYING HARE

One of nature's many examples of protective coloring; brown in summer, his coat changes to white with the coming of winter snows.

and broad, two small and roundish — spaced about a yard apart.

A hundred times, the winter before, we had tried that trail in the hope of finding the form or the burrow of its maker; but it crossed and turned and doubled, and always led us into a tangle, out of which we never got a clew. It was the track of the great Northern hare, as we knew, and we were relieved to see the strong prints of our cunning neighbor again; for what with the foxes and the hunters, we were afraid it might have fared ill with him. But here he was, with four good legs under him; and, after bagging our skunk, we returned to pick up the hare's trail, to try our luck once more.

We followed his long, leisurely leaps down the ridge, out into our mowing field, and over to the birches below the house. Here he had capered about in the snow, and had stood up on his haunches and gnawed the bark off a green oak sucker two and a half feet from the ground. This, doubtless, was pretty near his length, stretched out — an interesting item; not exact to the inch, perhaps, but close enough for us; for who would care to kill him in order to measure him with scientific accuracy?

Nor was this all; for up the footpath through the birches came the marks of two dogs. They joined the marks of the hare. And then, back along the edge of the woods to the bushy ridge, we saw a pretty race.

It was all in our imaginations, all done for us by those long-flinging footprints in the snow. But we saw it all — the white hare, the yelling hounds, nip and tuck, in a burst of speed across the open field that left a gap in the wind behind.

It had all come as a surprise. The hounds had climbed the hill on the scent of a fox, and had started the hare unexpectedly. Off he had gone with a jump. But just such a jump of fear is what a hare's magnificent legs were intended for.

Those legs carried him a clear twelve feet in some of the longest leaps for the ridge; and they carried him to safety, so far as we could read the snow. In the medley of hare-and-hound tracks on the ridge there was no sign of a tragedy. He had escaped again — but how and where we have still to learn.

MICE!

We had bagged our hare — yet we have him still to bag — and, taking up the trail of one of the dogs, we continued our hunt. One of the joys of this snow walking is having a definite road or trail blazed for you by knowing, purposeful feet.

You do not have to blunder ahead, breaking your way into this wilderness world, trusting luck to bring you somewhere. The wild animal or the dog goes this way, and not that, for a reason. You are watching that reason all along;

you are pack fellow to the hound; you hunt with him.

Here the hound had thrust his muzzle into a snow-capped pile of slashings, had gone clear round the pile, then continued on his way. But we stopped; for out of the pile, in a single, direct line, ran a number of mouse prints, going and coming. A dozen white-footed mice might have traveled that road during the twelve hours, more or less, since the snow had ceased falling.

We entered the tiny road, for in this kind of hunting a mouse is as good as a mink, and found ourselves descending the woods toward the garden patch below. Halfway down we came to a great red oak, into a hole at the base of which, as into the portal of some mighty castle, ran the road of the mice. That was the end of it. There was not a single straying footprint beyond the tree.

I reached in as far as my arm would go, and drew out a fistful of popcorn cobs. So here was part of my scanty crop! I pushed in again, and gathered up a bunch of chestnut shells, hickory nuts, and several neatly rifled hazelnuts. This was story enough. There was a nest or family of mice living under the slashing pile, who for some good reason kept their stores here in the recesses of this ancient red oak. Or was this some squirrel's barn being pilfered by the mice, as my barn is the year round? It was not all plain. But this question, this constant riddle of the woods, is part of our constant joy in the woods. Life in the forest, as in all the great realm of the out-of-doors, is always new, always strange, always fascinating.

UNTOLD TALES

It has all been studied and classified according to species. Anyone knowing the woods at all would know that these were mice tracks, would even know that they were the tracks of the white-footed mouse and not the tracks of the jumping mouse, the house mouse, or the meadow mouse. But what is the whole small story of these prints? What purpose, what intention, what feeling, do they spell? What and why? — a hundred times!

So it is not the bare tracks that we are hunting; it is the meaning of the tracks — where they are going and what they are going for. Burns saw a little mouse run across the furrows as he was plowing, and wrote a poem about it. So could we write a poem if we, like Burns, would stop to think what the running of these little mice across the snow might mean. The woods and fields, summer and winter, are full of poems that might be written if we only knew just all that the tiny snow prints of a wood mouse mean, or understood just what

> "root and all, and all in all,"

the humblest flower is.

MICE!

THE DOUBLE TRAIL

The popcorn cobs, however, I did understand; they told a plain story; and, falling in with a gray squirrel's track not far from the red oak, we went on, our burdenless game bag heavier, our hearts lighter that we, by the sweat of our brow, had contributed a few ears of corn to the comfort of this snowy winter world.

The squirrel's track wound up and down the hillside, wove in and out and round and round, hitting every possible tree, as if the only road for a squirrel was one that looped and doubled, and tied up every stump, and zigzagged into every tree trunk in the woods.

But all this maze was no ordinary journey. He had not run this coil of a road for breakfast, because a squirrel, when he travels, say for distant nuts, goes as directly as you go to your school or office; but he goes not by streets, but by trees, never crossing more of the open in a single rush than the space between him and the nearest tree that will take him on his way.

What interested us here in the woods was the fact that a second series of tracks just like the first, only about half as large, dogged the larger tracts persistently, leaping tree for tree and landing track for track with astonishing accuracy — tracks which, had they not been evidently those of a smaller squirrel, would have read to us most menacingly.

As this was the mating season for squirrels, I suggested that it might have been a kind of Atalanta's race here in the woods. But why did so little a squirrel want to mate with one so large? They would not look well together, was the answer of the small boys. They thought it much more likely that Father Squirrel had been playing wood tag with one of his children.

Then, suddenly, as sometimes happens in the woods, the true meaning of the signs was literally hurled at us, for down the hill, squealing and panting, rushed a large male gray squirrel, with a red squirrel like a shadow, like a weasel, at his heels.

For just an instant I thought it was a weasel, so swift and silent and gliding were its movements, so set and cruel seemed its expression, so sure, so inevitable its victory.

Whether it ever caught the gray squirrel or not, and what it would have done had it caught the big fellow, I do not know. But I have seen the chase often — the gray squirrel nearly exhausted with fright and fatigue, the red squirrel hard after him. They tore round and round us, then up over the hill, and disappeared.

THE SHARP PRINT OF THE FOX

One of the rarest prints for most snow hunters nowadays, but one of the commonest hereabouts, is the quick, sharp track of the fox. In the spring particularly, when my fancy young chickens are turned out to pasture, I have spells of fearing that the fox will never be exterminated here in this untillable but beautiful chicken country. In the winter, however, when I see Reynard's trail across my lawn, when I hear the music of the baying hounds and catch a glimpse of the white-tipped brush swinging serenely in advance of the coming pack, I cannot but admire the capable, cunning rascal, cannot but be glad for him and marvel at him, so resourceful, so superior to his almost impossible conditions, his almost numberless foes.

We started across the meadow on his trail, but found it leading so straightaway for the ledges, and so continuously blotted out by the passing of the pack, that, striking the wallowy path of a muskrat in the middle of the meadow, we took up the new scent to see what the shuffling, cowering water rat wanted from across the snow.

A SHUFFLER THROUGH THE SNOW

A man is known by the company he keeps, by the way he wears his hat, by the manner of his laugh; and among the wild animals nothing tells more of character than their manner of moving. You can read animal character as easily in the snow as you can read act and direction.

The timidity, the indecision, the lack of purpose, the restless, meaningless curiosity of this muskrat were evident from the first in the starting, stopping, returning, going-on track he had plowed out in the thin snow.

He did not know where he was going or what he was going for; he knew only that he insisted upon going back, but all the while kept going on; that he wanted to go to the right or to the left, yet kept moving straight ahead.

We came to a big wallow in the snow, where, in sudden fear, he had had a fit at the thought of something that might not have happened to him had he stayed at home. Every foot of the trail read, "He would if he could; but if he would n't, how could he?"

We followed him on, across a dozen other trails, for it is not every winter night that the muskrat's feet get the better of his head and, willy-nilly, take him abroad. Strange and fatal weakness! He goes and cannot stop.

Along the stone wall of the meadow we tracked him, across the highroad, over our garden, into the orchard, up the woody hill to the yard, back down the hill to the orchard, out into the garden, and back toward the orchard again; and here, on a knoll just in the edge of the scanty, skeleton shadow where the moon fell through the trees, we lost him.

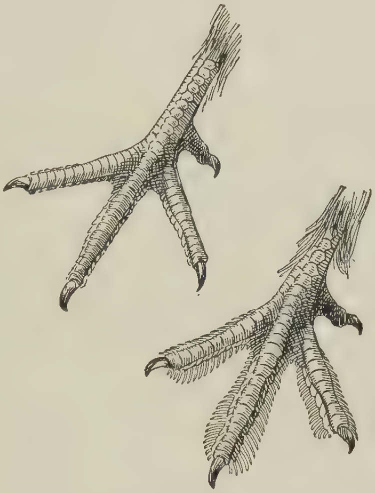
Two mighty wings, we saw, had touched the snow lightly here, and the lumbering trail had vanished as into the air.

Close and mysterious the shadowy, silent wings hang poised indoors and out. Laughter and tears are companions. Life begins but death often ends the trail.

OTHER TRAMPERS

Perhaps we have seen as much as any single day might show us; but we have not seen all that all the days of hunting the snow will show us.

To me this white page of the snow is always alluring, especially the quaint alphabetic characters printed on it by the feet of birds — the snow birds, the sparrows, the quails, and the broad snowshoe track left by the winter-shod feet of the partridge.



FOOT OF PARTRIDGE IN SUMMER AND IN WINTER

When winter comes, a double row of bristles grows out from the sides of each toe, enabling the partridge to walk on the snow with his own snowshoes.

If you wish another wood lover's account of his hunting, read John Burroughs's chapter in "Winter Sunshine" called "The Snow Walkers." It is in this delightful chapter that he says: "The snow is a great telltale and blabs as effectually as it obliterates. I go into the woods and know all that has happened. I cross the fields and if only a mouse has visited his neighbor the fact is chronicled."

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THE PASTURE BARS

RED-LETTER DAYS OUT-OF-DOORS: A YEAR OF TRAMPS

IN "Hunting the Snow" I asked which is the best day to be out-of-doors, and answered by saying that there is no "best day," that every day is a good — a best — day to be in the woods. Yet there are certain high or festival days, if we may so speak of them — "red-letter days," the department-store advertisements call them — which one cannot afford to miss. I wish to give you a list of these days as I have them marked on my calendar.

THE FEBRUARY RAIN

First. The day in February when it rains. To go out after a long cold spell and feel the rain falling upon your face is like having it spattered with spring. A February rain is my first sure sign of the spring's approach.

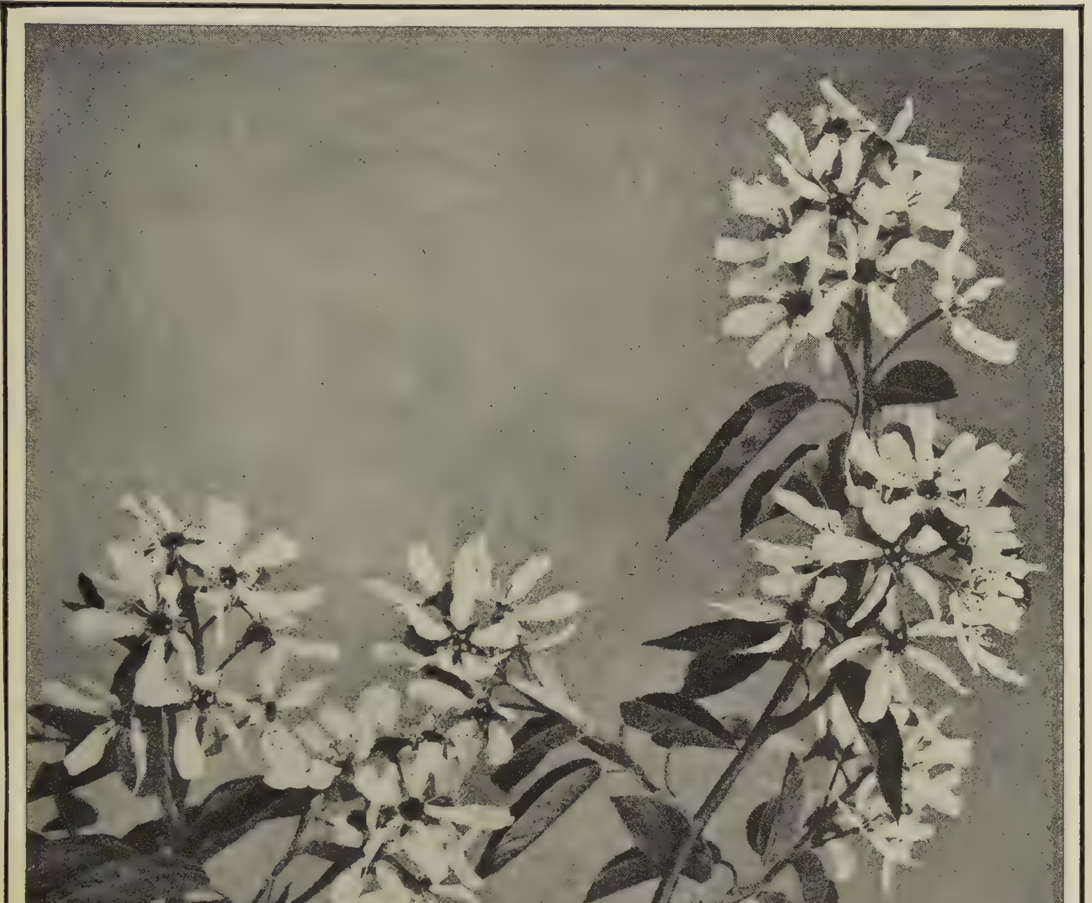
MARCH PEEPER DAY

Second. The day in March when the little frogs and toads — the tree frogs, or hylas, especially — come out in the wet, cold meadows. Why, I have known one of my little boys to break right out in the middle of bedtime prayers with, "Father, I hear the frogs!" And no wonder. If the celestial beings can make any sweeter music than the spring peepers after a long winter of silence, then let me truly sing:

"I want to be an angel
And with the angels stand."

BLUEBIRD DAY

Third. The real lover of the fields will drop things for a while on the day the bluebirds



"AT THE SIGN OF THE SHADBUSH"

Shadbush (*Amelanchier canadensis*) gets this name from the Indians, for it blossoms when the shad "run" up the creeks. In the interior it is called "service berry," because its berries are good to eat. But we rarely have a chance to taste them, for the birds get them first.

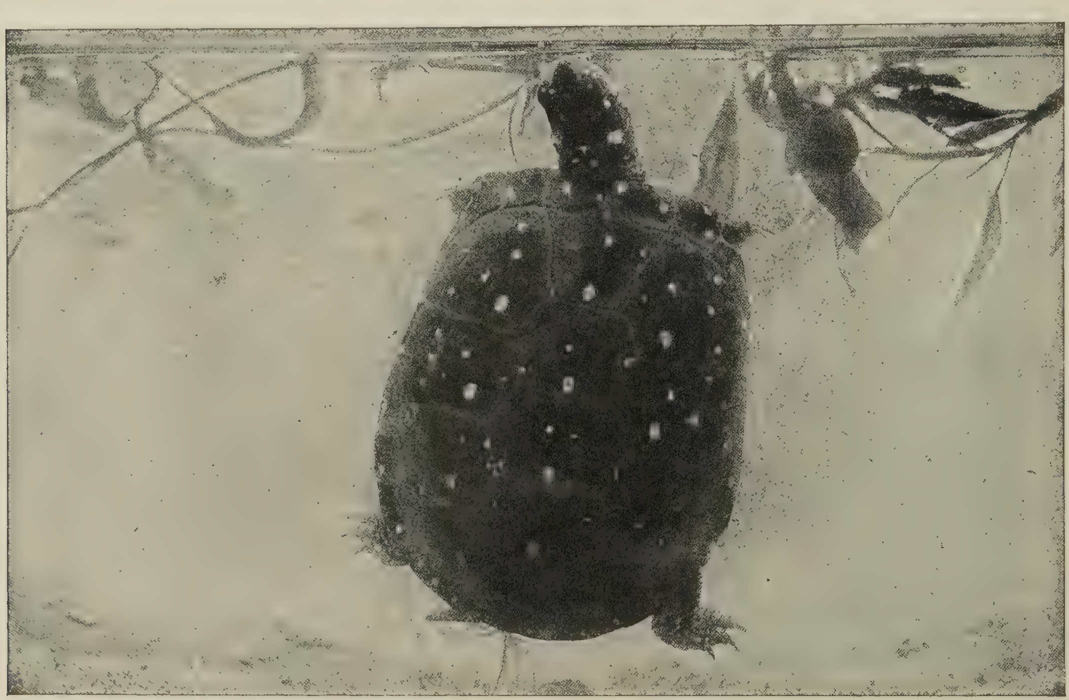
return. The indescribable sweetness of their "Florida! Florida!" everyone with a heart in him and any knowledge of Nature well knows. Spring *has* returned, no matter what the weather. And it is in defiance of the weather, the determination to get joy out of a last whirling flurry of snow, it may be, that I would have you get Bluebird Day as a woods holiday.

ARBUTUS DAY

Fourth. Don't miss a chance each spring to go for arbutus — or hepatica, or bloodroot, or spice bush, or marsh marigolds, or skunk cabbage, or whatever flower it is that ushers in your floral spring. The pussy willows and skunk cabbage are really my spring harbingers, but since early boyhood I have made it a joyous *duty* to go "Mayflowering" — as many people put it. Mayflowers, fish flowers, or arbutus, no matter. If the trailing arbutus grows anywhere in your vicinity, you see to it that one of the early spring days finds you out, with other observers of this seasonal celebration, on the wooded hill slopes gathering it — into your hands and, better, into your souls!

SPRING PLOWING DAY

Fifth. You may not be a farmer; you may have no plow of your own, nor ever hold the handles behind an easy-moving team in the field; but one of the experiences of the year that I covet for you is a day out-of-doors when the farmers are plowing. The grackles will light in the furrows behind you, the robins will sing in the cherry trees about the field, and with the green coming under the fences to set off long, straight lines of rolling, rich furrows you will enjoy a scene that painters love, and philosophers and Nature lovers as well. The smell of the soil — the first broken spring soil, with all the locked-up fragrance of the winter freed in it — what is there besides among earthly odors that tastes so of life and abundance?



SPOTTED TURTLE (*Chelopus guttatus*)

This very common Eastern turtle is often found sunning himself along the banks of brooks and ponds.

SHADBUSH DAY

Sixth. This is one of my own particular days. The shadbush, since I can remember, has stood to me for the wide-open door of spring. It is my May Day. I have found it often in April, but usually it comes into its misty bloom along in early May. And when I catch its shadowy, wavy plumes in the woods, I know it is time to overhaul my bees, get my tender seeds into the ground, and fling wide open the doors to welcome in the new season of life and growth.

Now I know that the shad are running up the rivers, and the herring and the catfish, too; that the migrating birds are passing, that all life everywhere is stirring, from the depths of the ocean to the fir-clad hills and mountains. Spring is coming, is the message of the hepatica; spring *has* come—is here now, says the shadbush.

TURTLE DAY

Seventh. This is my own *June* holiday. No, it is not down in the almanac. It is not an American holiday, though it ought to be. We will make our own, for if there is one day lovelier than all the others of the year — more nearly perfect—I should say it is the day when the turtles come out of the pond to lay. You know it — the day when spring and summer meet, when the tides of sunlight, soft winds, bird songs, and flowers flood the whole landscape, and so deep that you are set to drifting, or shall I say dreaming? Then you want to drift and dream. And small wonder, for even the sluggish, cold-hearted turtles feel it and crawl out of their mud and wander afield to lay! It was Turtle Day that Lowell had in mind when he wrote of June:

> "Then if ever come perfect days."

But you ought to watch the turtles lay, as well as enjoy their glorious weather. You will find a whole chapter upon the laying of the turtles in "The Face of the Fields."

ONE O'CLOCK DAY

Eighth. The hands of the great clock of the year have passed twelve — have reached around to one o'clock and begun to move down into the afternoon.

It is a July day. At dawn the birds were singing almost as in spring. Then the sun burned through the mist and the chorus ceased until the woods were as empty as a darkened church. Not even a chewink is heard -- nothing but the fiery notes of the scarlet tanager, which is still caring for its young in the tall oak trees. All is hot, silent, sleepy in the fields. Far off is heard the hum of a mowing machine, and at your feet, in the crisp withered leaves of the sweet fern, is the flaming cup of the red wood lily — the flower of the sun, the emblem of the heat and fire of midsummer. Call it Wood Lily Day if you will; but let one of these burning July days find you on the turf beneath some ancient pasture tree, when, lying outstretched, you must wait until you can feel the pulse of the heat of the earth in the soil beneath you and the creeping of your little brother, the beetle, under your outstretched arms.

EGGS OF THE SPOTTED TURTLE

MEADOW DAY

Ninth. There comes a day in August when I take a fish pole and go off to some large meadow through whose stretches crosses a little stream. I may catch a few raccoon perch, but what I really go for is the life of the stream — the rich, rank flowers that border it — Joe-pye weed, elder, boneset, turtlemouth, touch-me-not, peppermint, and rose mallow; for the big meadow spider, epeira, the one with a yellow body and the zigzag stairs of white web through his net; for the grasshoppers and crickets, the flocking blackbirds and finches—for a revel in the fullness of the summer's life.

FIRST-FROST DAY

Tenth. School has begun for most of you — even for me — and September finds us cut off from the woods, except on Saturdays.

"Every rambler has noticed how song gives place to silence toward the end of August. The monotony of soulless sunshine has proved irksome, and the birds that have not already departed cluster by the dripping springs. The squirrels, until now a timid and day-shunning folk, thread the tall, outreaching oaks, tapping, in ill humor, at the still resisting acorns. Impatience is now the moving factor of the animal world, and with it is sulky silence. Furred and feathered life, alike, are heartily tired of summer and await a change — do they know what? He who is given to country rambles has long since learned the secret — it is the first frost.

"The first frost does not usher in a new season, but renews the summer. Sleepy, silent August days, half stifled in a worn-out atmosphere, are the really melancholy ones, 'the saddest of the year'; but at once, with the first frost, is activity renewed. The pulses of the song birds quicken, and they resume their singing. Their limp wings are braced, and they scatter along the wooded hillside and close-woven thicket. Not only they, the wearied summer visitors, reappear among their several springtime haunts, but down from a frostier north the advance guard of the winter songsters come — Canadian tree sparrows, a cheery, twittering host — come, as do many others, to make glad our winters and replace those that, fearing to face the ruder blasts of the north wind, seek shelter in the south." [1]

NUTTING DAY

Eleventh. Shall I ever grow too old to take a sack and my stick (and now my boys) and go into the October woods for nuts — chestnuts, black walnuts, pignuts, shagbarks, hazelnuts and the big thick-walled hickory nuts, if the others fail? No, I hope not. The crisp air, the rustling leaves, the smell of the "mast," that is, the fallen leaves, twigs, acorns, and other things from the trees that cover the earth, how stirring to the blood! how clearing to the brain! how fortifying to the soul is it all!

What have nuts to do with Nature study? Just what good bread and butter have to do with red blood and health. Nuts draw you into the woods; they give you a good reason for going and a real thing to do while you are there. What we want in all of this volume and in all your living is the real out-of-doors; so that anything that takes you afield is to the point and of value to us.

The flowers, the buds, the bees, the leaves of October! If you don't go for nuts, go for autumn leaves.

INDIAN SUMMER DAY

Twelfth. Dr. Abbott has said that Indian Summer is "half mythical." So it is if November proves to be stormy from first to last. But if, as usually happens, "there come calm, mild days," then of all the days in the year you will find these the sweetest, rarest, fastest-flying as you lie on some sheltered bank and watch the down of goldenrod and bankweed float with the ballooning spiders over the meadow. The ballooning spiders! Did you ever see them?

You ought to see the spiders in their airships, sailing over the autumn meadows. Take an Indian Summer day, lazy, hazy, sunny, and lie down on your back in some small meadow where woods or old rail fences hedge it 'round. Lie so that you do not face the sun. The sleepy air is heavy with balm and barely moves. Soon shimmering, billowing, through the light, a silky skein of cobweb will come floating over. Look sharply, and you will see the little aëronaut swinging in his basket at the bottom of the balloon, sailing, sailing —

> "Away in the air —
> Far are the shores of anywhere,
> Over the woods and the heather."

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[1] From Dr. C. C. Abbott's "Days Out-of-Doors." By permission of D. Appleton & Co.

"THE MELANCHOLY DAYS"

Thirteenth. Or, if it suits your mood better, go out on a gloomy day —

> "The saddest of the year,
> Of wailing winds and naked wood and meadows brown and sere,"

for there are things to *feel* in the woods and open country as well as things to see and hear. But *there are* still these things — plenty of them on the dreariest of our drear November days.

"Winter's skirmishers, the white frosts," says the author of "Days Out-of-Doors," "have strewn many a field with dead flowers, and who cares to crush their bleached skeletons at every step? But, deflecting a little from the preceding day's course, I have sometimes avoided these sad reminders of the defeated summer and chanced upon sheltered nooks from which the besieging frosts have retired discomfited.

"One such, strange as it may seem, was a wide reach of level meadow dotted with old trees. The day was essentially forbidding. A gray sky, a fog-patched atmosphere, and a fitful, chilly breeze that smote my cheek whichever way I turned were discouraging at the outset, but abundant recompense awaited me, for the meadow was yet beautiful, green as in May, and rang with the voices of a thousand forms of life. The meadow mice held high carnival in their grass-hidden runways; the birds of the season, best equipped of all creatures for finding where summer still lingers, had congregated here. Snakes still tarried, although the nights are cool, and insect life crowded alike the trees, shrubbery, and sod, singing and humming without appreciable rest; and above all I heard from the tangled marsh afar off a regretful frog twanging his unstrung harp.

"Small areas of such cheerful meadow are not uncommon, and during November and all through the winter they are a source of wonder. A sense of mystery rests over them. An acre, or perhaps ten or more, of living green, surrounded by hundreds of lifeless brown, impresses everyone who sees it. At least, I have escaped the man or woman, boy or girl, who could pass it by totally unheeded."

THE DAY OF THE DECEMBER SNOW

Fourteenth. I have already had you take a February day off to feel the spatter of the rain upon your face and to catch the pulse of newly awakening life that comes with the breaking up of ice-bound brooks and waters. Now take a day in December to be out with the storms — the wilder and fiercer the better. It is a sign of old age when you have lost the joy of fighting a gale, of climbing to the top of some tall tree and swaying in the wind, or to the crown of some high hill where you can face the howling powers from the north — face them, defy them, and cause them to send your red blood leaping redder with the ruddy hue of life as it beats back the deadly cold.

No one who would come to know all the moods of Nature will miss the chance to fight a winter wind and to see the forests wrapped in the ermine snow.

NEW YEAR'S DAY

Fifteenth. How can you better spend the holiday (if it is a holiday) than in the open — on snowshoes or skates? Take a day off (as many as you can, in fact) for the sake of gliding alone up the river or into the hidden places at the head of the home pond. Here, if the ice is "glare," that is, clear and new, without snow or skate-marks, lie flat down upon it and watch the fishes and life on the bottom. Or, when the moon comes up and the colder air begins to grip the pond, listen to the ice cracking — the groan that literally splits the vast, thick sheet from shore to shore.

Finally — there is no "finally" to these three hundred and sixty-five days, for as fast as one year's quiver of them is empty another full quiver is slung upon your shoulder for you to speed and spend.

Your skies and heaths may lie far away from mine — far in the sunny south, or far in the frozen north; your buds and trees and flowers then will not be the same, nor your signs and seasons; but the days of the year will be as interesting to you, and out of the three hundred and sixty-five you will find more than one for each month of the year when you will need to be out-of-doors.

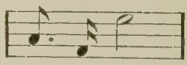
THINGS TO LISTEN FOR IN THE SPRING[1]

THE FROGS

THE frogs! You can have no spring until you hear the frogs. The first shrill notes, heard before the ice is fairly out of the marshes, will be the waking call of the hylas, the tiny tree frog that later on in the summer you will find in the woods. Then, as the spring advances and this silvery sleigh-bell jingle tinkles faster, other voices will join in — the soft croak of the spotted leopard frog, the still softer melancholy quaver of the common toad, and away down at the end of the scale the deep, solemn bass of the great bullfrog saying, "Go round! Knee-deep! Wade in! Go round!"

THE WOOD THRUSH

You must hear, besides the first spring notes of the bluebird and the robin, four bird songs this spring: (1) The song of the brown thrasher, our finest, most gifted songster, as great a singer, I think (and I have often heard them both), as the Southern mocking bird. After the brown thrasher (2) the wood thrush or the hermit thrush, whichever one lives in your neighborhood. No words can describe the purity, the peacefulness, the spiritual quality of the wood thrush's simple "Come to me." It is the voice of the tender twilight, the voice of the tranquil forest, speaking to you. Then (3) the operatic catbird. She sits down lower among the bushes than the brown thrasher, as if she knew that, compared with him, she must take a back seat; but for variety of notes and length of song she has few rivals. I say *she*, when really I ought to say *he*, for it is the males of most birds that sing; but the catbird seems so long and slender, so dainty and feminine, that I think of this singer as of some exquisite operatic singer in a woman's rôle. Then (4) the bobolink; for his song is just like Bryant's



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[1] From "The Spring of the Year," by Dailas Lore Sharp. By permission of Houghton Mifflin Company.

THE BULLFROG (*Rana catesbiana*)

The king of frogs. He says, "Go round, go round," as if he meant to send you around the world and back.

bubbling poem, only better! Go to the meadows in June and listen as he comes lilting and singing over your head.

THE KINGFISHER, THE DOWNY WOODPECKER, AND THE FLICKER

There are some birds that cannot sing — the belted kingfisher, for instance; he can only rattle. You must hear him rattle. You can do as well yourself if you will shake a "pair of bones" or heave an anchor and let the chain run fast through the hawse hole. You then must hear the downy woodpecker doing his rattling *rat-ta-tat tat tat tat* (across the page and back again), as fast as *rat* can *tat.* How he makes the old dead limb or fence post rattle as he drums upon it with his chisel bill! He can easily be heard for half a mile or more around.

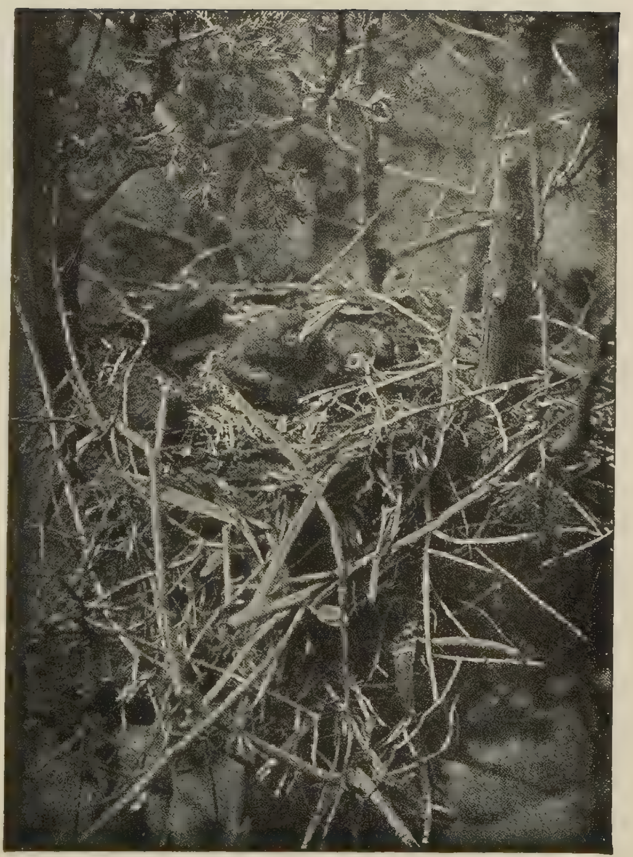
Then High-hole, the flicker (or golden-winged woodpecker), you must hear him yell, *yar-up-up-up-up-up-up-up-up-up-up-up-up* — a ringing, rolling, rapid yodel that echoes over the spring fields.

THE NIGHTHAWK AND THE WHIP-POOR-WILL

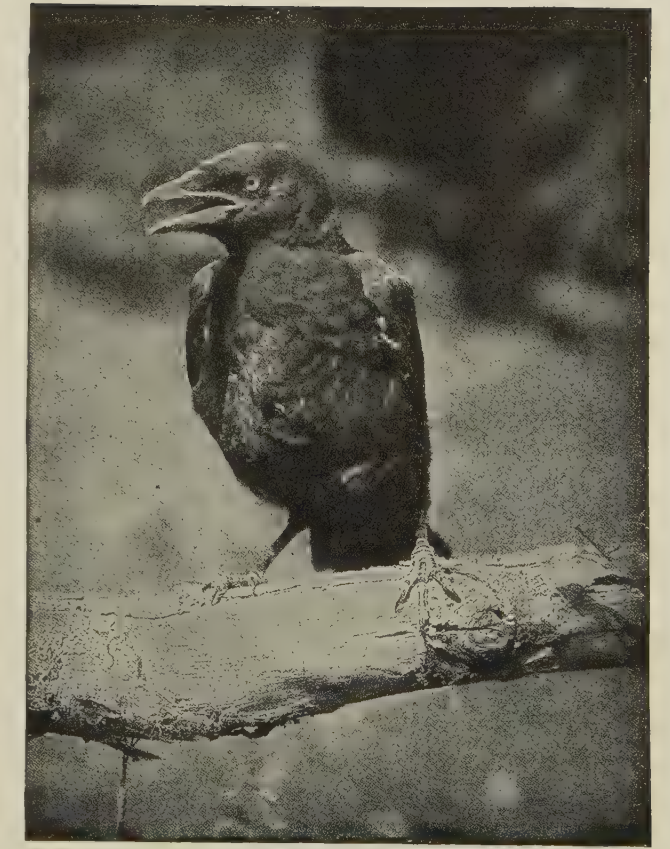
You must hear the nighthawk and the whip-poor-will. Both birds are to be heard at twilight, and the whip-poor-will far into the night. At the very break of dawn is also a good time to listen to them.

At dusk you will see (I have seen him from the city roofs in Boston) a bird about the size of a pigeon mounting up into the sky by short flights, crying *peent,* until far over your head the creature will suddenly turn and, on half-closed wings, dive headlong toward the earth, when, just before hitting the ground, upward he swoops, at the same instant making a weird booming sound, a kind of hollow groan, with his wings, as the wind rushes through their large feathers. This diver through the dim ocean of air is the nighthawk. When one of the birds dives close to your head on a lonely, dusky road, your hair will try to jump out from under your hat.

The whip-poor-will's cry you all know. When you hear one this spring, go out into the twilight and watch for him. See him spring



CROW'S NEST WITH YOUNG NEARLY READY TO FLY



YOUNG CROW SOON AFTER LEAVING THE NEST

into the air, like a strange shadow, for flies; count his *whip-poor-wills* (he may call it more than a hundred times in as many seconds!). But hear a circle of the birds, if possible, calling through the darkness of a wood all around you!

THE DANCE SONG OF THE WOODCOCK

There is one strange bird song that is half song and half dance that perhaps most of you may never be able to hear and see; but as it is worth going miles to hear and nights of watching to witness, I am going to set it here as one of your outdoor tasks or feats — hear the mating song of the woodcock. I have described the song and the dance in "Roof and Meadow," in the chapter called "One Flew East and One Flew West." Mr. Bradford Torrey has an account of it in his "Clerk of the Woods," in the chapter named "Woodcock Vespers." To hear the song is a rare experience for the habitual watcher in the woods, yet one that you might have the first April evening that you are abroad.

Go down to your nearest meadow — a meadow near a swampy piece of woods is best — and here, along the bank of the meadow stream, wait in the chilly twilight for the *speank*, *speank*, or the *peent*, *peent*, from the grass — the signal that the song is about to begin.

YOUNG CROWS

One of the dreadful — positively dreadful — sounds of the late spring that I hear day in and day out is the gobbling, strangling, ghastly cries of young crows feeding. You will surely think something is being murdered. The crying of a hungry baby is musical in comparison. But it is a good sound to hear, for it reminds one of the babes in the woods — that a new generation of birds is being brought through from babyhood to gladden the world. It is a tender sound! The year is still young.

THE HUM OF THE HONEY MAKERS

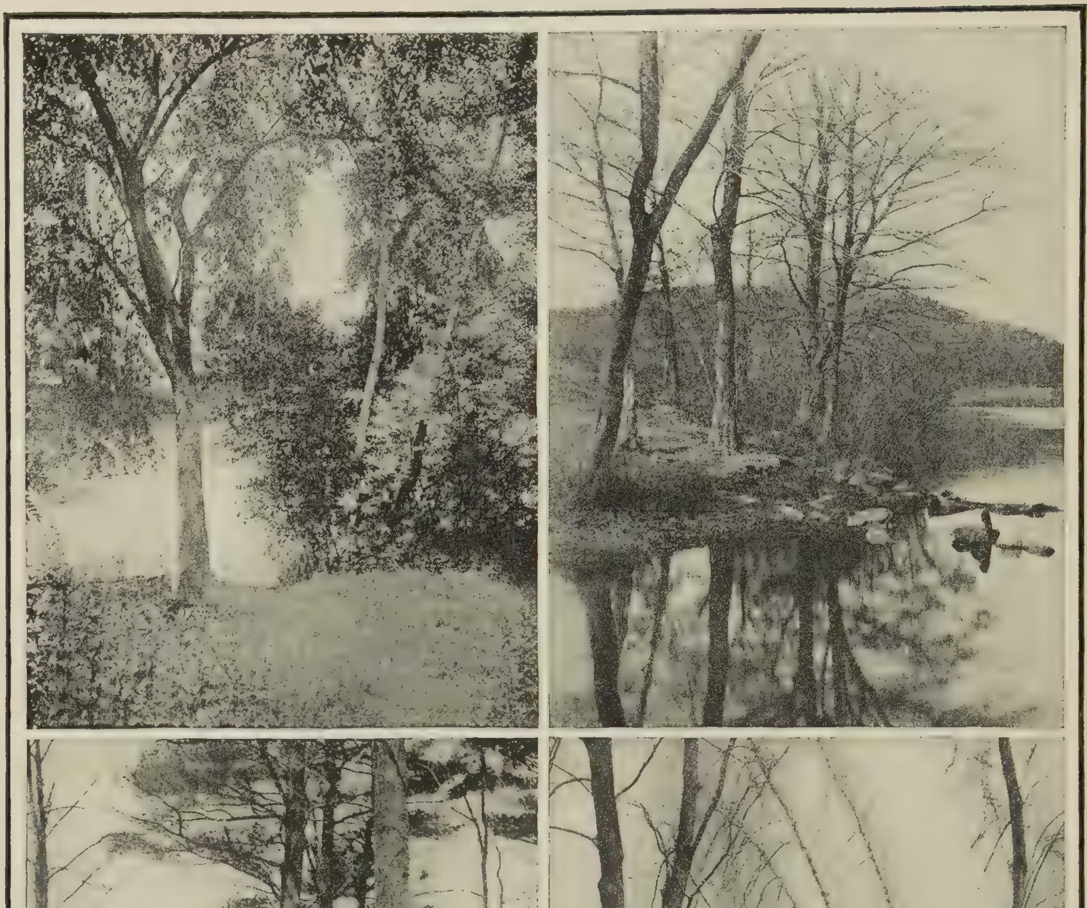
You should hear the hum of the honeybees on a fresh May day, in an apple tree that is just coming into perfect bloom. The enchanting loveliness of the pink and white world of blossoms is enough to make one forget to listen to the *hum-hum-hum-humming-ing-ing-ing-ing* of the excited bees. But hear their myriad wings, fanning the perfume into the air and filling the sunshine with the music of work. The whir, the hum of labor — of a busy factory, of a great steamship dock — is always music to those who know the blessedness of work; but it takes that knowledge, and a good deal of imagination besides, to hear it. Not so with the bees. The season, the day, the colors, and perfumes — they are the song; the wings are only the million-stringed æolian upon which the song is played.

HEARING THE GRASS GROW

You should hear the grass grow. What! I repeat, you should hear the grass grow. I have a friend, a sound and sensible man, but a lover of the out-of-doors, who says he can hear it grow. But perhaps it is the soft stir of working earthworms that he hears. Try it. Go out alone one of these April nights; select a green pasture with a slope to the south, at least a mile from any house or railroad; lay your ear flat upon the grass, and listen without a move for ten minutes. You hear something — or do you feel it? Is it the reaching up of the grass? Is it the stir of the earthworms? Is it the pulse of the throbbing universe? Or is it your own throbbing pulse? It is the heart of the grass beating in every tiny living blade. You should listen to hear the grass grow.

THE THUNDER IN THE CHIMNEY

The fires have gone out on the open hearth. Listen early in the morning and toward evening for the rumbling, the small, muffled thunder, of the chimney swallows, as they come down from the open sky on their wonderful wings. Don't be frightened. It is n't Santa Claus this time of year; nor is it the Old Nick! The smothered thunder is caused by the rapid beating of the swallows' wings on the air in the narrow chimney flue, as the swallows settle down from the top of the chimney and hover over their nests. Stick your head into the fire-



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QUIET WOODS AND WATERS

place and look up! Don't smoke the precious lodgers out, no matter how much racket they make.

THE ROBINS IN THE RAIN

Hurry out while the last drops of your first May thunder shower are still falling and listen to the robins singing from the tops of the trees. Their liquid songs are as pure as the raindrops, as if the drops in falling were running down from the tree tops in song—as indeed they are in the overflowing trout brook. Go out and listen, and write a better poem than this one that I wrote the other afternoon when listening to the birds in our first spring shower:

The warm rain drops aslant the sun
  And in the rain the robins sing;
Across the creek in twos and troops,
  The hawking swifts and swallows wing.

The air is sweet with apple bloom,
  And sweet the laid dust down the lane,
The meadow's marge of calamus,
  And sweet the robins in the rain.

O greening time of bloom and song!
  O fragrant days of tender pain!
The wet, the warm, the sweet young days
  With robins singing in the rain.[1]

THE WATER SOUNDS OF THE POND

If you live in the vicinity of a pond, an old mill pond, such as I used to know when a boy, go out in the dusk on a perfectly windless evening and listen to the water sounds. There is nothing else just like them to be heard in the woods — the slap of a fish's tail on the surface of the sleeping pond; the splash of a muskrat as he dives into his roadway; and close to you the small, mysterious sounds of bubbles. Is it the breathing of fishes?

THE CALL OF THE MIGRANTS

As soon as your ear is trained to catch these native frequent sounds, you will begin to listen for some of the rarer notes — for the calls of the migrating warblers as they stop a few hours in your trees to greet you; the songs of the white-capped, the white-throated, and the fox sparrows as they tarry, sometimes for days, on their leisurely journey northward. Every bird lover watches the hedges and woods during the swiftly passing days of the spring migration. The geese and brant and ducks are going over, and many a rare shore bird, with a score of other transients that can be heard at no other time of the year. In the fall they go over far up in the sky, and for the most part go silently.

OTHER CALLS

So I have suggested, as you will note, only things to go out to *listen* to in the spring. There are things to see also, and things to do, in the same spring. Here are a dozen suggestions, that will give you the loud, or striking, or characteristic notes of the season. Now these are not all by any means; indeed, these are only a beginning, a few hints to sharpen your ears and give you a start into the fields. Add to these dozen things to hear another dozen to see and another dozen to do — thirty-six reasons for spring tramps — and you have a good start toward an acquaintance with this one season of the year.

Now besides spring please bear in mind there are summer, autumn, and winter.

Photographed by Silas A. Lottridge
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"THE SPLASH OF THE MUSKRAT AS HE DIVES INTO HIS ROADWAY"

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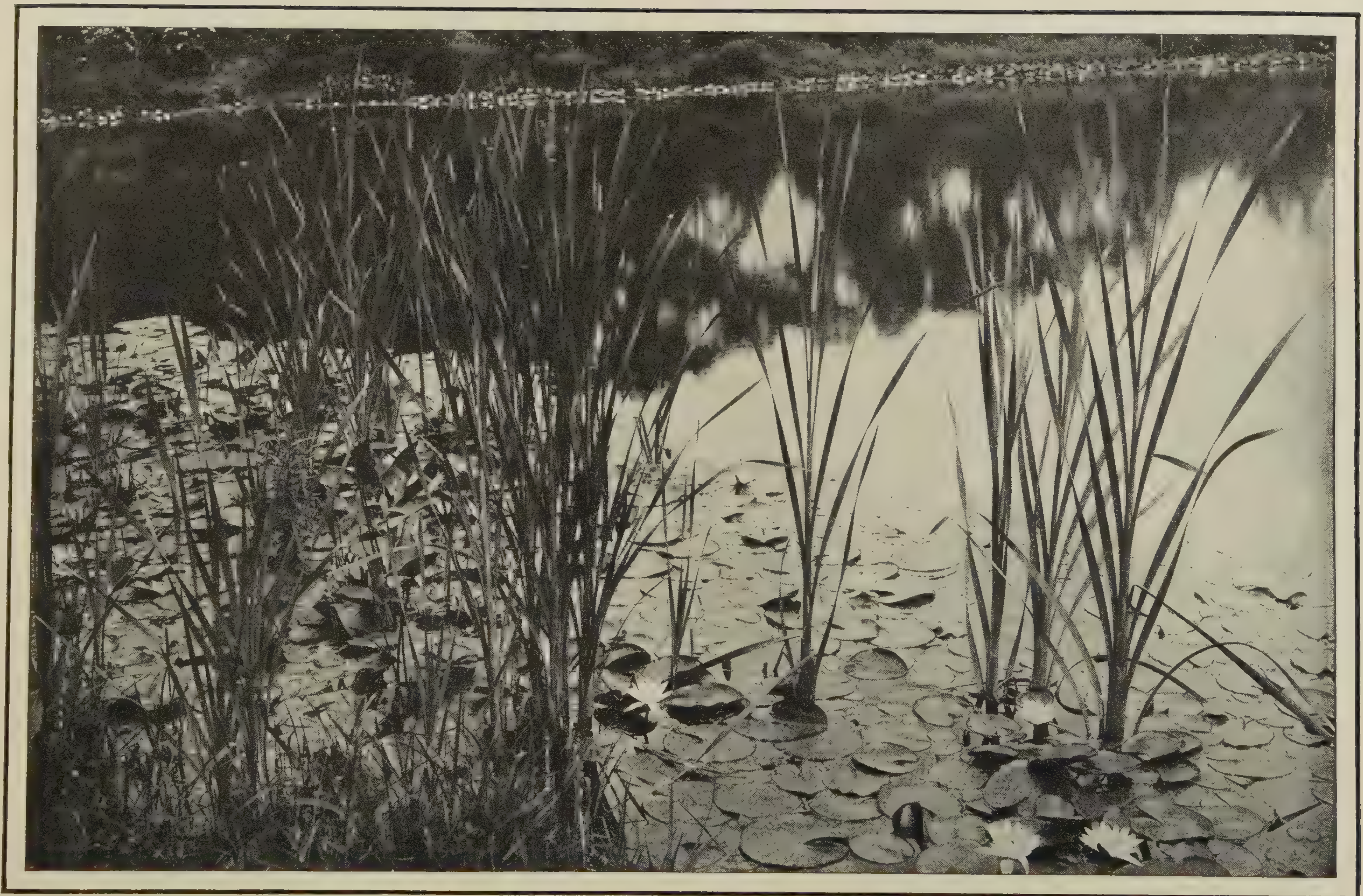
[1] By permission of Houghton Mifflin Company.



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SWEET WATER LILIES (*Nymphæa odorata*) ALONG THE RIVER

By W. E. Carlin

DEER PHOTOGRAPHED IN MAINE WOODS AT NIGHT

TRAMPS FOR THE SUMMER

YOU begin your learning to read by studying your A, B, C's—at least you ought to. So in your Nature study begin at home with the common things that are easily seen and watched. Now the commonest creatures about your home or in your woods are very well worth watching for, aside from their interest as living beings. They are still only half known to the most watchful of us. You might easily discover something entirely new concerning them.

CHIPMUNK AND BIRDS' EGGS

In an article in a recent number of an out-of-door magazine, of wide circulation, the chipmunk family was most roundly rated, in fact condemned to annihilation, because of its wicked taste for birds' eggs and for the young birds. Numerous photographs accompanied the article, showing the *red squirrel* with eggs in his mouth, but there was no such proof (even the red squirrel photographs, I strongly believe, were done from a *stuffed* squirrel) of Chipmunk's guilt, though he was counted equally bad and, doubtless, will suffer with Chickaree at the hands of those who have taken the article seriously.

I believe that a great mistake. Indeed, I believe the article a deliberate falsehood, concocted in order to sell the photographs. Chipmunk is not an egg sucker, else I should have found it out. But that does not mean that no one else has caught him at it. No. It does mean, however, that if Chipmunk robs at all, he does it so seldom as to call for no alarm or retribution.

There is scarcely a day in the nesting season when I fail to see half a dozen chipmunks about the walls, yet I have never noticed one even suspiciously near a bird's nest. In an apple tree, scarcely six jumps from the home of the family in the orchard wall, a brood of swallows came to wing this spring; while robins, chippies, and red-eyed vireos — not to mention a cowbird, which I wish they had devoured — have also hatched and flown away from nests that these squirrels might easily have rifled.

It is not often that one comes upon even the red squirrel in the very act of robbing a nest. But the black snake, the glittering fiend! And the dear house cats! If I run across a dozen black snakes in the early summer, it is safe to say that six of them are discovered by the cries of the birds they are robbing. So it is with the cats. No creature larger than a June bug, however, was ever distressed by a chipmunk.

COUNTING UP YOUR TENANTS

Take your pencil and paper one of the June days of this year, especially if you live or are visiting in the country, and count up the number of tenants that are living with you in your house and yard and barn; or on your farm, or in your close neighborhood — so close that you can call them neighbors. On my fourteen acres I have seventy-six different tenants, not counting five times that number of insects.

Such a "numbering of the tribes" will greatly add to your interest in your "dull" dooryard or neighborhood. How can the world be dull with so many strange and different little people, each with his own intense personal life to live, existing side by side with you upon it?

THE BIRDS'-NEST ROUND

One of the fascinating trips that I and my four boys take — that they take me upon, really — is the round of birds' nests that we are watching. Beginning with the robins in the cedar by the north porch, and the chippies' nest in the old-fashioned rose at the kitchen porch, we go to the pigpen to look at Phœbe, then to the apple trees to see the flickers (I forgot the barn swallows' nest in the corner of the barn), then to the stream for the song sparrow, then to the brier patch for the catbird, to the cut-offs or sprouts on the hillside for the brown thrasher, to the wood lot for the crows — on one day taking in twenty-four different nests.

THE CHICKADEE [1]

Do you know little Chickadee? He is one of the list left out of the round above, because I wish to give him special mention here.

He is the only bird in my out-of-doors that I can find three hundred and sixty-five days in the year. From December to the end of March he comes daily to my lilac bush for suet; from April to early June he is busy with domestic cares in the gray birches down the hillside; from August to December he and his family come hunting quietly and sociably as a little flock among the trees and bushes of the farm; and from that time on he reports every morning for his winter meals at "The Lilac."

Is it any wonder that he was the first bird I ever felt personally acquainted with? That early acquaintance, however, was not brought about by his great abundance, nor by his very bad, bold manners, as it might be with the English sparrow. I got acquainted with him first because he wanted to get acquainted with me, he is such a cheerful, confiding, sociable little bird! He drops down and peeps under your hat brim to see what manner of boy you are, and if you are really fit to be abroad in this world, so altogether good both summer and winter — for chickadees.

He is not quite so sociable in summer as in winter, but if you were no bigger than a chickadee (two and one half inches without his tail!) and had eight babies nearly as big as yourself to hunt grubs for, besides a wife to pet and feed, do you think you could be very sociable?

He almost disappears in the early summer. But this is because of family cares, and because the bigger, louder birds have come back and the big leaves have come out and hidden him. A little searching, and you will discover him, in one of your old decayed fence posts, maybe, or else deep in the swamp, foraging for a family of from six to eight young birds, that literally bulge and boil over from the door of their home.

Here about Mullein Hill, this home is sure to be a gray-birch one. Other trees will do—on a pinch. I have found Chickadee nesting in live white oaks, maples, upturned roots, and tumbling fence posts. These were shifts only, mere houses, not real homes. The only good homelike trees are old gray birches, dead these many years and gone to punk — mere shells of tough, circular bark walls.

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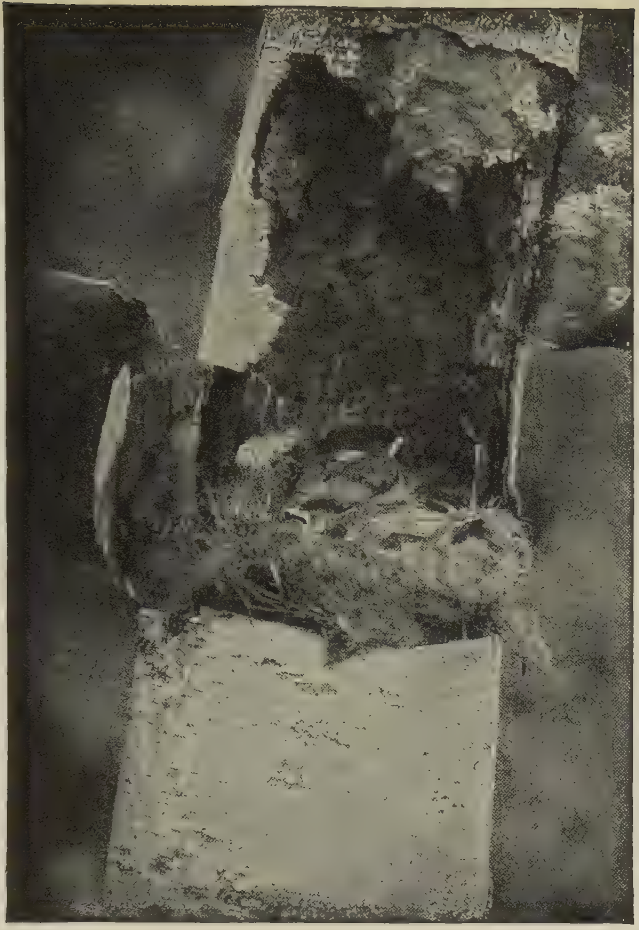
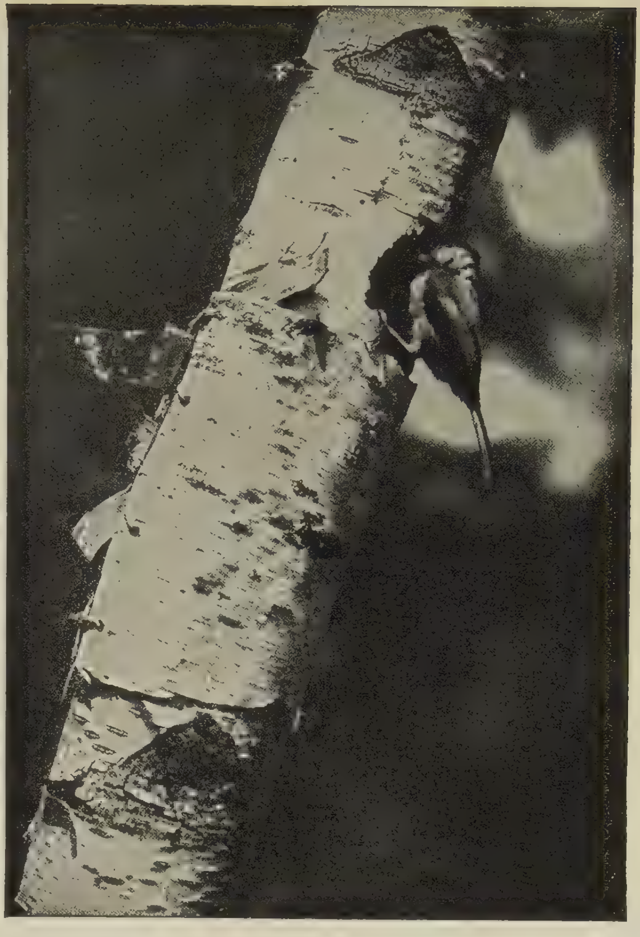
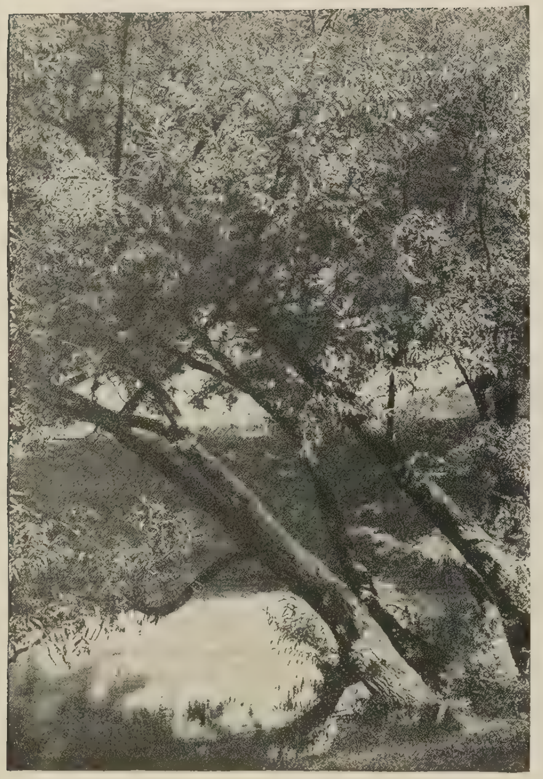
[1] From "The Lay of the Land," by Dallas Lore Sharp. By permission of Houghton Mifflin Company.



INTERIOR OF CHICKADEE'S NEST WITH YOUNG BIRDS



CHICKADEE ABOUT TO ENTER ITS NEST WITH FOOD FOR YOUNG



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WHERE THE WILLOWS HANG OVER THE STREAM

THE LITTLE WOOD DUCK[1]

Do you live near a mill pond? And will you undertake a long, hard search this summer as part of your Nature study? If so, then try to discover if there is a wood duck, the most beautiful of all water fowl, in your neighborhood.

Formerly — no longer ago than when I was a boy — these lovely creatures were common over a very wide range. I have seen them within a few years in the far-off wilds of Oregon; but in this neighborhood of my home, and throughout the whole eastern half of the country, they are rapidly disappearing.

I believe that I knew the last nest of them that was built along Silver Run, which was the last timbered tract about my boyhood home to shelter the birds.

One of the young of this nest was hatched out under a hen by one of my neighbors and lived with the hens on the farm. So I knew him and all his family really since egghood.

I knew his parents before him. Where Silver Run grows darkly silent and glides into the open pond, there still leans the great maple stub, from the hollow top of which this little duck and eleven others, in their buff-white shells, were taken and carried away to my neighbor's farm.

A sweeter, wilder home never was than this along the run. Lake and swampy wood lie all around. Moss-grown oaks and maples shadow the cedar-scented stream which slips directly beneath the broken stub and widens — first among a hundred tiny islands, then into the quiet, unbroken surface of the pond.

More than once I have pushed softly into the run, led by one of the wood ducks. Stemming ahead of the skiff, with a grace that would make me forget the charm of his exquisite dress, he would quietly lead me to the bend beyond the stub and go ashore, lost instantly in the thick swamp tangle.

Or I would slip up and catch him half asleep, when he should have been very wide awake, for the one in the stub could not see out, and he was on guard. *Oe-eek, oe-eek!* he would whistle low in alarm. Then, recognizing me, he would calmly watch while I edged past. Or I would come up and find no one about. I would tap. There in the splintered top she would stand, interested, but not disturbed, and with a look of trust in her eyes that I never could betray.

The little duck of my neighbor's was the only one of the brood to survive his motherless ducklinghood. He throve in the barnyard, and came through the winter to perfect and beautiful maturity. Up to this time he had been content in the barn, but when the first February wedge of wild geese passed honking through the skies, he grew restless and got into the habit of flying over to the swale, where he stayed until dusk.

He was dressed for a wedding, but his bride was not among the big, overgrown ducks of the yard. He sought her in the meadow. Day after day he sought her, but she was not there. He waited for her coming. Others came. Line after line beat northward, high overhead, and he called; but they fanned on — they were scooters or mallards or goosanders.

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[1] From "Wild Life near Home," by Dallas Lore Sharp. By permission of The Century Company.

The little wood duck had not been taken in the autumn on the long south journey by his mother, where he might have found a bride. But then his mother did not make the journey that fall. The day that her eggs were stolen she was shot from the top of the stub, and her world — and mine — of lake and wood was robbed.

The spot is still wild and sweet, but the charm of its life is gone. I hoped the little wood duck would find a bride and bring her back to the old home tree. He was my last hope. There was no other wood duck around that I knew. Indeed, his parents in the stub were the only pair I had ever known in their own home. He, now, alone of his beautiful kind, was left to me; and he had no mate.

Day after day he waited for her in the swale; night after night he returned. Then came a night when he did not return. Morning came and another night.

Anxiously I pulled up the lake and drew softly into the Run. There stood the old stub. Had little wood duck found his bride and brought her home?

I caught a bit of bush by the bank and waited. Then, drawing near, I tapped gently. No, he had not come yet.

And that, too, was many springs ago.

The old maple stub still leans out over the run; and still, whenever I can, I push quietly in among the shadows and remember — for the little wood duck, if he found a mate, never brought her back to the old home tree.

I wonder if you can find him and his bride in some hollow old stub in your Silver Run?

Courtesy of Field Museum of Natural History, Chicago

A PAIR OF WOOD DUCKS

BIRDS AND MEN

Why do the wood birds so persistently build their nests along the paths and roads? I said that even the hermit thrush prefers a wood with a road through it. If he possibly can, he will build along that road. And what one of the birds will not? Is it mere stupidity? Is it curiosity to see what goes on? Is there some safety here from enemies worse than boys and cats and dogs? Or is it that these birds take this chance for human fellowship? If this last is the reason for their rejecting the deep tangles for limbs that overhang roads and tufts of grass in constantly traveled footpaths, then they can be pardoned; otherwise they are foolish — fatally foolish.

The first black-and-white warbler's nest I ever found was at the base of a clump of bushes in a narrow wood path not ten feet from a highway. There were acres of bushes beyond, thick and pathless, all theirs to choose from.

Photo L. W. Brownell

DOWNY WOODPECKER

Will you look into this matter during the summer? Perhaps you will not find my observations true to your own. But if you will go into the deep woods — the mountains — then come back to your orchards, you will surely be struck by the real desire on the part of the birds to cultivate our good opinion, or at least their evident love for our near neighborhood. Why? Read what Burroughs and Thoreau have said about it, and James Buckham in his chapter in "Where Town and Country Meet," called "Birds from a Suburban Window."

A BERRYING EXPEDITION

I am sorry for the child who never got a tin kettle or pail and went off to the summer hillsides for berries. All sorts of things come to light when you are busy picking wild strawberries or blackberries or huckleberries or cranberries or barberries or raspberries or — But where is the end of our berry crop? Do you know them — the kinds you can eat, to say nothing of the kinds that merely look pretty?

But to come back to the other things I had in mind — the things you stumble upon, the things that happen when you are busy *not* looking for them, because you are picking berries.

One day, as I was quietly picking wild strawberries on a hill, I heard a curious grunting down the side below me, then the quick *thud*, *thud* of an angry rabbit. Among the bushes I caught a glimpse of rabbit ears. A fight was on.

Crouching beside a rabbit's nest was a yellow cat. He had discovered the young ones, and was making mouths at them when the mother's thump startled him. He flattened, with ears back, tail swelled, and hair standing up along his back, as the old rabbit leaped over him. It was a glimpse of Molly's ears, as she made the jump, that I had caught.

The cat was scared, and before he got himself together Molly, with a mighty bound, was in the air again, and, as she flashed over him, she fetched him a stunning whack on the head that knocked him endwise. He was on his feet in an instant, but just in time to receive a stinging blow on the ear that sent him sprawling several feet down the hill. The rabbit seemed constantly in the air. Back and forth, over and

HOP-TOAD IN NEWLY PLOWED GARDEN

over the cat she flew, and with every bound landed a terrific kick with her powerful hind feet, that was followed by a puff of yellow fur.

The cat could not stand up to this. Every particle of breath and fight was knocked out of him at about the third kick. The green light in his eyes was the light of terror. He got quickly to a bush and ran away, else I believe that the old rabbit would have beaten him to death.

FRONT DOORSTEP DISCOVERIES

Take a walk to your front doorsteps and sit down to see if there may live under them a quiet old toad. Of course, if you live on Fifth Avenue, New York City, or Euclid Avenue, Cleveland, there won't be any toad under your step; and if you live in a city flat, up to which you are shot in an elevator, you won't have any front step even. But the majority of us still have dooryards and doorsteps — a favorite place for old Mr. Bufo, the toad.

Just after sunset, when the fireflies light up and the crickets and katydids begin to chirp, the toad that sleeps under my front step hops out of bed, kicks the sand off his back, and takes a long look at the weather. He seems to *think*, as he sits here on the gravel walk, sober and still, with his face turned skyward. What does he think about? Is he listening to the chorus of the crickets, to the whip-poor-wills, or is it for supper he is planning? Who knows? Some day, perhaps, I shall understand what it is that my doorstep lodger turns over and over in his mind as he watches the coming of the stars. All I can do now is to time his cogitations, and I remember one evening when he sat thinking and winking a full hour without making a single hop.

As the darkness comes down, he makes off for a night of bug hunting. At the first peep of dawn, bulging plump at the sides, he turns back for home and goes to sleep under the step.

A TRIP DOWN THE RIVER

Whether you are fortunate enough to live near a tide river or not, you must make a point of taking a row, in a small boat, where you can nose along the muddy banks and be always close to the water and the rushes. For here is a different aspect of Nature — a new set of odors, new growths, new bird and animal life from the upland and inland life. The blue mud flats, with their fiddler crabs and crayfish; the long-tasseled reeds, where the bobolinks soon will be flocking; the beds of green-bladed

Courtesy of Canadian Pacific Ry.

A GLIMPSE OF THE CANADIAN ROCKIES

calamus; the high mud banks with their sluices and channels; the fish hawks wheeling over; the vast marshes that are likely to reach away to the sea or the bay — all of these are part of the *whole* world in which you live, and each of them a link in the wonderful chain that binds the world of wild life together.

A TRIP DOWN THE SHORE

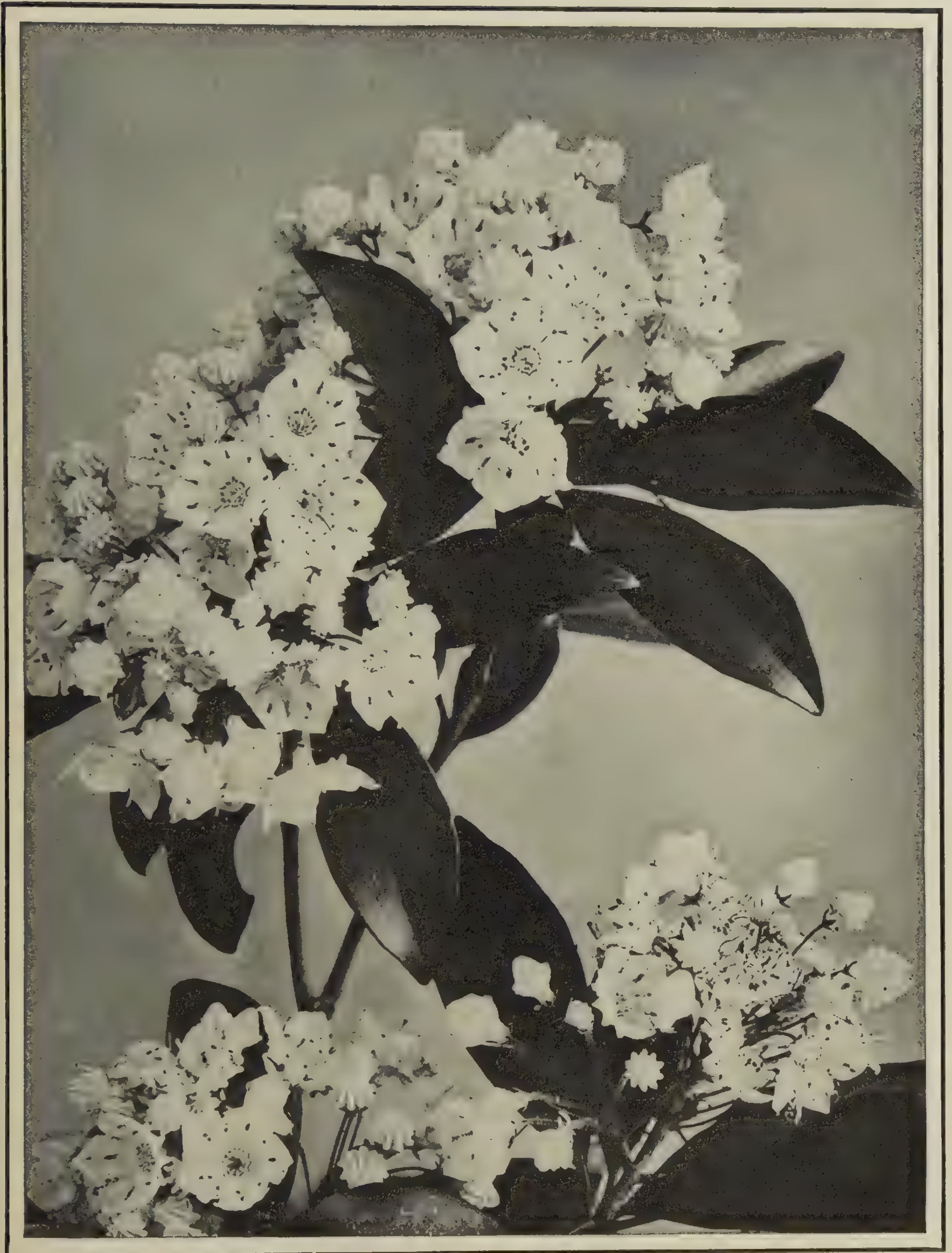
So again you will make at least one trip to the ocean shore — if that is possible. Of course it is not possible for any who dwell far inland, a thousand miles from the sea. Let them then take a trip to the shore by means of a good book. Let them read "Cape Cod," by Thoreau; or "The Sea Beach at Ebb Tide," by Augusta Foote Arnold; or "Life and Her Children," by Arabella Buckley.

But, if possible, go yourself to the shore and watch a tide rise and fall; hunt over the seaweed rocks for shells and crabs and starfish, and over the sand for worms and flies and clams; look off at the boundless horizon; see the smoke of the steamers streaming against the low-lying sky; hear and see the gulls feeding in the water and the terns flying past. Throw yourself upon the sands or down on the top of some high headland and wait until the vastness of it all, the mystery of it all, the power and freedom of it enters into your imagination, to stay with its taste of briny spray forever.

A TRIP TO THE MOUNTAINS

All of these suggestions cannot be followed out in any one summer. But what I wish to do is to call your attention to the variety of aspects, distinct faces, that Nature wears.

It will quicken your interest and keep your world out-of-doors ever fresh to know that the desert, or the prairie, or the rich farm lands, or the village fields, or the river marsh, or whatever region it may be that you live in is



MOUNTAIN LAUREL, THE GLORY OF EARLY SUMMER HILLSIDES

When the visiting bee crawls inside the corolla of the pink-tinted flowers of the mountain laurel (*Kalmia latifolia*), he steps upon a little trigger. Each stamen goes pop! and covers him with yellow pollen.

not all there is to the out-of-doors; that your little world is only one of many worlds of the out-of-doors that you may visit and learn to love — each of them with its own peculiar complexion and sorts of life.

THE FLOCKING SWALLOWS

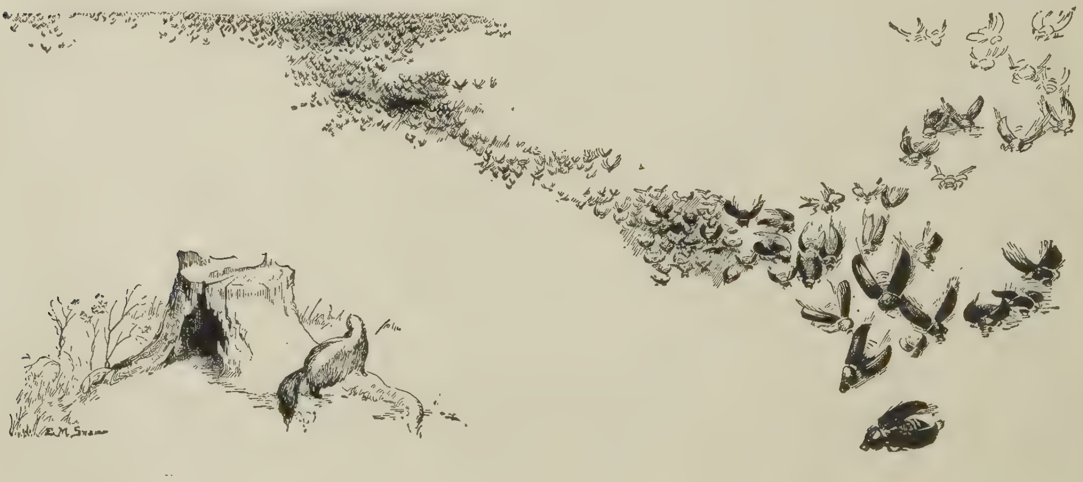
There are so many typical things doing in the open these summer days that I can find no end to the suggestions. But before I close this chapter let me urge you to be out for the gathering of the swallows on the telegraph and telephone wires. Here is a characteristic summer sight, which at the same time is a reminder of how quickly the season is passing — for it is a sign of autumn, too.

What does the gathering mean? Winter! Yes, and more. It means that there is a like gathering from your lines of swallows northward almost to the arctic pole. It means that yonder in the darkening north the travelers are preparing for the most wonderful journey in the world.

"Mallard, widgeon, teal, plover, geese, swans," says Mr. Alan Sullivan, "all the broad and narrow billed brotherhood assembles. Night and day the tumult of them ascends. There is eating of sand for digestion, and digging of shellfish to harden muscles softened by the sweet things of the plains, for it is common knowledge that there will be no more sea food till they sight the swamps of the Gulf of Mexico. The air is black with trial flights of young birds trying the strength of young pinions, coming back to earth with calls and whistles and quacking and trumpeting. Old birds, strong of wing and weatherwise, mount to invisible spaces, looking for that whisper of the north that all await, till, as the autumn days of Indian Summer pass, the colonies grow strong and clean and confident."

OTHER PLACES TO GO

There are other reasons for going afield these summer days, other places than those mentioned for you to go. I have said nothing of camping, nothing of extended tramping over, say, the White Mountains or the Joseph Mountains, or through some lovely river course such as the Potomac. I cannot do all that in one volume. I can only say, Live out-of-doors; sleep, tramp, eat, do all you can out-of-doors; and keep eyes and ears and mind alert for all the summer may bring.



By W. E. Carlin

RED SQUIRREL (*Sciurus hudsonicus gymnicus*)

AUTUMN EXCURSIONS[1]

SIX SUGGESTIONS FOR AN AUTUMN TRIP

YOU ought to go out into the fields and woods as many as six times this fall, even though you have to take a long street-car ride to get out of the city. Let me give you just six bits of sound advice about going afield:

GO OFTEN

First. Go often to the same place, so that you can travel over and over the same ground and become very familiar with it. On the first trip you will not see much but woods and fields. But after that, each succeeding walk will show you *particular* things — this dead tree with the flicker's hole, that old rail pile with its rabbit hole — until by and by you will know every turn and dip, every pile of stones, every hole and nest; and you will find a thousand things that on the first trip you did n't dream were there.

GO EXPECTING TO SEE THINGS

Secondly. When you go into the woods, go *expecting* to see something in particular — always looking for some particular nest, bird, beast, or plant. You may not find the particular thing you are looking for, but your eyes will be sharpened by your expectation and purpose, and you will be pretty sure therefore to see something. At worst you will come back with a disappointment, and perhaps that may be regarded as better than coming back without a thing!

GO ALONE

Thirdly. Go off, when you can, alone. Don't be selfish, unsociable, offish — by no means that. But you must learn to use your own eyes and ears, think your own thoughts, make your own discoveries, and follow the hints and hopes that you alone can have. Go with the school class for a picnic, but for woodcraft go alone.

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[1] From "The Fall of the Year," by Dallas Lore Sharp. By permission of Houghton Mifflin Company.

BE SILENT

Fourthly. Learn when in the woods to be as silent as an Indian and as patient as a granite rock. Practice standing still when the mosquitoes sing, and fixing your mind on the hole under the stump instead of the hole the mosquito is boring between your eyes.

SEE THE WOODS BY NIGHT

Fifthly. Go out in every variety of weather, and at night as well as during the day. There are three scenes to every day — morning, noon, and early evening—when the very actors themselves are changed.

To one who has never been in the fields at daybreak, the world is so new, so fresh and strange, as to seem like a different planet. And then the evening — the hour of dusk and the deeper, darker night! Go once this autumn into the woods at night.

THE OUTDOORS NOT A NOAH'S ARK

And lastly, don't go into the woods as if they were a kind of Noah's Ark; for you cannot enter the door and find all the animals standing in a row. You will go a great many times before seeing them all. Don't be disappointed if they are not so plentiful there as they are in your books. Nature books are like menageries — the animals are caught and caged for you. The woods are better than books and just as full of things, as soon as you learn to take a hint, to read the signs, to put two and two together and get — four — four paws — black paws, with a long black snout, a big ringed and bushy tail — a coon!

A BAG FOR NUTS IS A GOOD EXCUSE

You should go out one of these frosty mornings for chestnuts, if they grow in your woods; or for shagbarks, if you live in New England; for black walnuts, if you live in the Middle states; for pecan nuts, if you live in the Gulf states; for butternuts, if you live in the states of the Middle West; for — what kind of nuts can you not go for, if you live in California where they make everything grow! It matters little whether you go for paper-shelled English walnuts or for plate-armor pignuts so long as you *go*. It is the going that is worth while.

WILD FLOWERS AFTER THANKSGIVING

Take your botany can on a trip toward the end of November and see how many blossoming flowers you can bring home from the woods. Wild flowers *after* Thanksgiving in any northern state? Make the search, on all the southern slopes and in all the sheltered corners, and see for yourselves. When you get back, you will want to read Mr. Bradford Torrey's account of the flowers that he found blossoming out-of-doors in New England in the month of November. But who is Mr. Bradford Torrey, and where can you find this account of his November walk? You do not know? Well, then there is something more for you to do this fall.

SOME GOOD BOOKS TO READ WHEN YOU COME HOME

While you are finding out who Mr. Torrey is and what he has written, you should also get acquainted with John Burroughs, Olive Thorne Miller, Thoreau, Frank Bolles, William Hamilton Gibson, C. C. Abbott, Edward Breck, Gilbert White, and — but these will do for *this* fall. Don't fail to read dear old Gilbert White's "Natural History of Selborne"; though perhaps we grown-ups like it better than you may this fall. If you don't understand Gilbert White, then read this year "The Life of a Scotch Naturalist," by Samuel Smiles, and Arabella Buckley's two books, "Life and Her Children" and "Winners in Life's Race."

BEGIN WITH THE WILD WINTER RESIDENTS

Whether you live in the heart of a great city or in the open country, you ought to begin this fall to learn the names and habits of the birds and beasts (snakes, lizards, turtles, toads!) that live wild in your region. Even when all the summer birds have gone south for the winter, there will remain in your woods and fields crows, jays, juncos, tree sparrows, chickadees, kinglets, nuthatches, screech owls, barred owls, — perhaps even snowy owls, — quails, partridges, goldfinches, with now and then a flock of crossbills, snow buntings, and other northern visitors, and even a flicker, robin, and bluebird left over from the fall migrations. These are plenty to begin on; and yet, as they are so few, compared with the numbers of the summer, the work is thus all the easier in the autumn.

Photograph by Brownell

ARROWWOOD BERRIES (FROM THE OCTOBER WOODS)

IF YOU LIVE IN THE CITY

If you live in the city, you ought to go up frequently to your roof and watch for the birds that fly over. If in one of our many cities near the water, you will have a chance that the country boy seldom has, of seeing the seabirds — the white herring gulls (the young gulls are brown and look like a different species) — as they pass over whistling plaintively, and others of the wild sea fowl, that merely to hear and see in the smoky air of the city is almost as refreshing as an ocean voyage. Then there are the parks and the public gardens — never without their birds and, at the fall migrating time, frequently sheltering the very rarest of visitors.

A BUNCH OF AUTUMN BERRIES

In order to give point and purpose to one of these autumn outings, you should take your basket or botanizing can and scour the woods and fields for autumn berries. No bunch of flowers in June could be lovelier than the bunch of autumn berries that you can gather from thicket and wayside to carry home. And then, in order to enjoy the trip all over again, read James Buckham's exquisite story, "A Quest for Fall Berries," in his book, "Where Town and Country Meet."

COCOONING

You ought to go "cocooning" this fall — to sharpen your eyes. But do not go often; for once you begin to look for cocoons you are in danger of seeing nothing else — except brown leaves. And how many brown leaves, that look like cocoons, there are! They tease you to vexation. But a day now and then cocooning will do you no harm; indeed, it will cultivate your habit of concentration and close seeing as will no other kind of hunting I know.

Bring home with you the big brown silky cocoons of cecropia — the largest cocoon you will find, lashed all along its length to its twig, and usually near the ground. Look on the black cherry, the barberry, sassafras, and roadside and garden trees for the harder, whiter cocoon of the promethea moth. This hangs by its tip, because the caterpillar has begun his house by using the leaf, spinning it into the cocoon as part of its walls, much as does the wretched "brown-tail." The gray cocoons, or rather nests, of this brown-tail moth you must bring home to burn, for they are one of our greatest pests. You will find them full of tiny caterpillars as you tear them open.

Bring home your collection and, with the help of such a book as "Moths and Butterflies," by Mary C. Dickerson, identify them and hang them up for their "coming out" in the spring.

A BIT OF FAT FOR THE HUNGRY BIRDS

You ought to tie up a piece of suet for the birds; keep your cat in the house, except during the middle of the day, and — but I shall tell you no more. There is no end to the interesting things to do in your study of the out-of-doors and in your tramps afield this autumn.

A FEAST FOR THE CHICKADEE

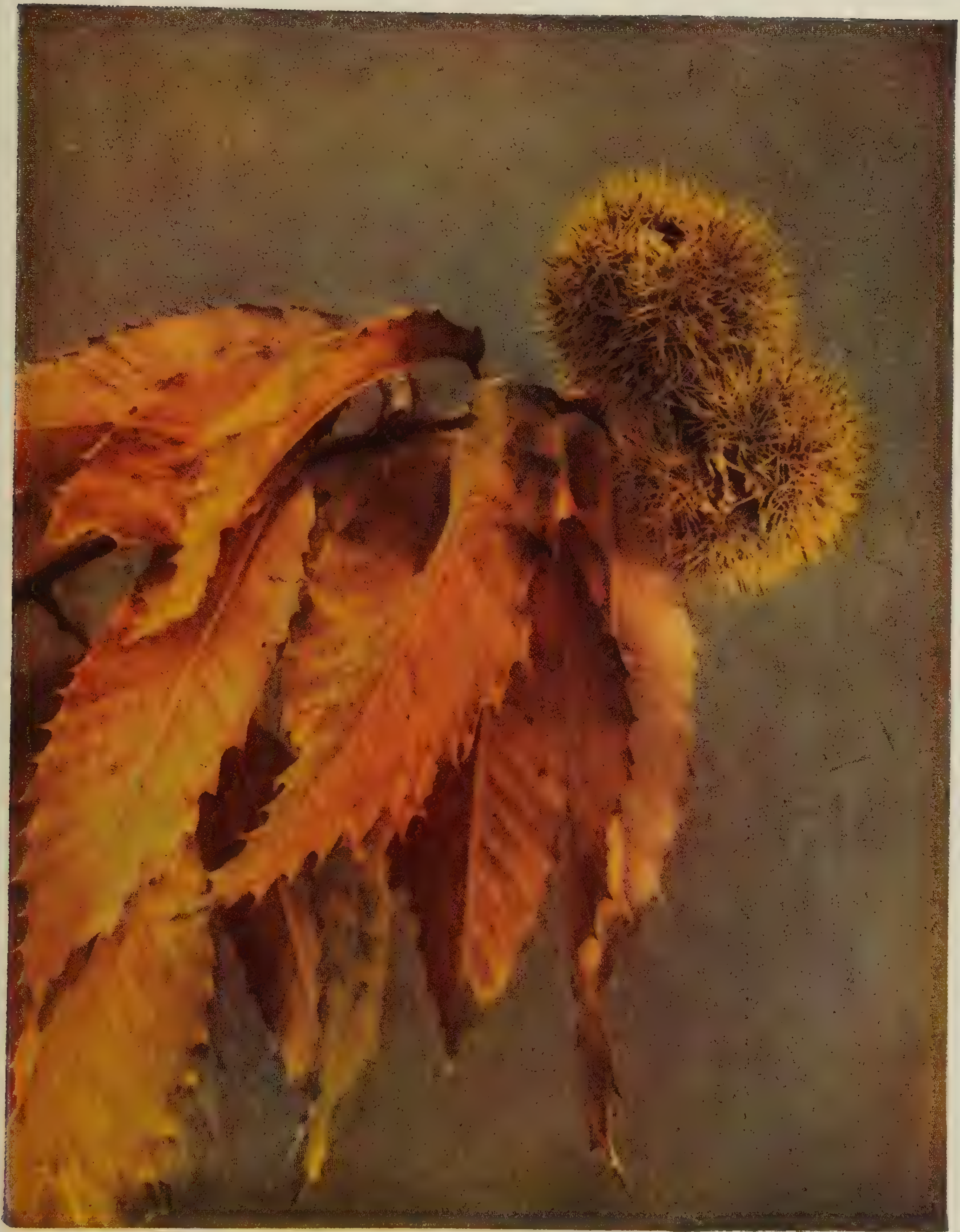
PREPARING FOR THE COLD

You ought to watch the animals and birds, the trees too, and all living things about you this fall to see what special preparations they each make against the biting teeth of the coming cold. Cold kills. But see the various and intensely interesting shifts that the creatures and plants make to protect their lives during this cold period. I have watched the muskrats building their winter lodge — and written about them in the book called "The Fall of the Year" (Chapter VIII). I have watched the squirrels, the frogs, the birds that leave and those that stay, and I find that all these small lives have powers and resources entirely equal to the occasion. There is nothing more interesting that you can do in the autumn than to watch this preparation on the part of all life to withstand or escape the cold.

You ought to help some farmer cut and shock corn and pile the golden squashes up in the field. Farmer yourself or city bred, you will love the work —

"When the frost is on the pumpkin and the fodder 's in the shock."

You ought to take a rake and pile up the falling leaves, then, getting the right permit, smell them burn. Perhaps that sounds foolish. No, it is n't foolish. That smell of autumn leaves and the odor of thin smoke all your ancestors, since the great Stone Age, have smelled. When they were children they ran among them too, and "rustled" them with their feet. It is these ancient, primitive, elemental sights and sounds and smells and doings that we all need, for they take us back not only to Nature, but back also to our ancestral past. Thus they put us in touch with our ancestors of ages gone, and keep us simple, and capable of understanding and enjoying simple, natural things.



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FRUITING BRANCH OF THE CHESTNUT TREE

Ewing Galloway

WINTER ACTIVITIES

I HAVE already taken you hunting for animal tracks across the snow. Now let me suggest a dozen other trips to come off between Thanksgiving Day and the last day of winter — by the almanac, which, of course, is the 21st of March.

SOME WINTER BEDS

Make one trip about Thanksgiving time to see how it fares with the birds and beasts who are to stay with us all winter — especially look to see how they are housed. One of the most fascinating studies you can make is this one on the beds of the birds and beasts. In "Wild Life near Home" you will find two chapters dealing with this theme, and in "The Lay of the Land" another chapter called "The Muskrats are Building" in which I have set forth the results of many of my winter tramps among the wild things who bide with us during the cold.

As a special object, go out some dreary winter afternoon so that you can come home in the gloom of the twilight; and choose if you can a day that is dark with a coming storm for a study of the birds' beds.

I say *beds*, not *nests*, for the birds do not sleep in the old nests. They are used only as cradles in the summer, and once the young fly they never return.

But where do the tree sparrows, the juncos, the nuthatches, the chickadees, the goldfinches, the meadow larks, the quails, the jays, and the crows sleep?

THE MEADOW LARKS' BED

Take the meadow larks, for instance. These birds used to stay all winter in the fields about my boyhood home, and in "A Watcher in the Woods" I have this account of their beds:

"The meadow larks always roost upon the ground. They creep well under the grass, or, if the wind is high, and it snows, they squat close to the ground behind a tuft of grass or thick bush and sleep while the cold white flakes fall about them. They are often covered before the morning; and, when housed thus from the wind and hidden from prowling enemies, no bird could wish for a cozier, warmer, safer bed.

"But what a lonely bed it is! Nothing seems so utterly homeless and solitary as a meadow lark after the winter nightfall. In the middle of a wide, snow-covered pasture one will occasionally spring from under your feet, scattering the snow that covered him, and go whirring away through the dusk, lost instantly in the darkness — a single little life in the wild, bleak wilderness of winter fields!

"Again, the grass is often a dangerous bed. On the day before the great March blizzard of 1888, the larks were whistling merrily from the fences, with just a touch of spring in their call. At noon I noted no signs of storm, but by four o'clock — an hour earlier than usual — the larks had disappeared. They rose here and there from the grass as I crossed the fields, not as they do when feeding, far ahead of me, but close to my feet. They had gone to bed. By early evening the snow began to fall, and for two days continued furiously.

"A week later, when the deep drifts melted, I found several larks that had perished from cold or starvation, or had smothered under the weight of snow."

THE CROW ROOST

If you live within a radius of a hundred miles of Philadelphia, perhaps you can find a crows' roost. The crows have a curious habit (or used to when I was a boy) of gathering, according to good authorities, from all the Eastern states, to roost in vast flocks in the region lying about Philadelphia as center.

In the "American Naturalist" for August, 1886, Mr. Samuel W. Rhoades has published an interesting article on these birds and their habits, but at the very outset I am puzzled by certain of his statements. He writes: "Careful observation and inquiry convince me that during winter a radial sweep of one hundred miles, described from the city of Philadelphia and touching the cities of New York, Harrisburg, and Baltimore, will include in the daytime in its western semicircle fully two thirds of the crows inhabiting North America, and *at night* an equal proportion of its eastern half. The eastern area of this circle, with the exception of more fertile portions of west and north Jersey, is as notably devoid of them by day as it is infested by them at night. Their most extensive breeding grounds in New Jersey are well-nigh deserted during severe weather."

As a boy I lived on the Jersey side of the Delaware about forty miles below Philadelphia and within sight of one of the greatest of these crow roosts. It was a large clump of pine trees at the head of Cubby Hollow, a little wood-walled pond that lay about half a mile south of my home. Let me give you the picture as I have it in "A Watcher in the Woods":

"About the middle of the afternoon, during the severest weather, they begin to fly over to the roost at the head of the Hollow, coming in from the surrounding fields, some of them from miles away, where they have been foraging all day for food. You can tell the character of the weather by the manner of their flight. In the fall and spring they went over, cawing, chasing each other, and performing in the air; they were happy, and life was as abundant as the spring promise or the autumn fullness everywhere. But in January the land is bare and hard, and life correspondingly lean and cheerless. You see it in their heavy, dispirited flight; all their spring joyousness is gone; they pass over silent and somber, reluctant to leave the fields and fearful of the night. There is not a croak as they settle among the pines — scores, sometimes hundreds of them, in a single tree.

"Here, in the swaying tops, amid the heavy roar of the winds, they sleep. You need have no fear of waking them as you steal through the shadows beneath the trees. The thick mat of needles or the sifted snow muffles your footfalls; and the winds still the breaking branches and snapping twigs. What a bed in a winter storm! The sky is just light enough for you to distinguish the dim outlines of the sleepers as they rock in the waves of the dark green that rise and fall above you; the trees moan, the branches shiver and creak, and high above all, around and beneath you, filling the recesses of the dark wood, rolls the volume of the storm.

"But the crows sleep on, however high the winds, sitting close to the branches, that the feathers may cover their clinging feet, their heads tucked beneath their wing coverts, protecting themselves thus from the fierceness of the storm."[1]

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[1] From "The Lay of the Land."

"WITH SNOW STILL IN THE WOODS"

SOME SNUG BEDS OF THE BEASTS

On another day go forth to find where the wild mice and the coon and the muskrat and the possum and the squirrels are sleeping.

Did you ever see an old robin's nest, with a deck of leaves or bark shreds over it and the whole capped like a tiny haystack with snow? Now you search the woods this winter until you do find such a nest, even if you climb into scores of trees to do it, for it is the snug winter home of the white-footed mouse, or deer mouse.

WHITE FOOT'S TOWER

How often I have waked him from his bed! I recently did it right near the house.

It was a dreary world out-of-doors surely, with not a sign of life. The pine tree, rising up above the hillside in front of the window, was green; but among the middle branches of the oaks only a few lifeless leaves rattled. Up in the stark top of a hickory sapling was wedged a robin's nest, deserted and wet and going to pieces as the rest of the winter world seemed to be deserted and going to pieces.

I shivered in spite of the hearth fire behind me, for the face of the gray gloom pressed close up against the window outside. And the empty robin's nest, already a ruin, its mud walls broken, its tiny timbers hanging loose in the rain—what a dreary thing to look out upon! And I thought of the poem about there being no birds in last year's nests.

Photographed by Silas A. Lottridge
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NEST OF WHITE-FOOTED MOUSE

But how large a nest for a robin, I thought, and how strangely peaked and pointed it is, like a little haycock! Then all at once, inside of me and all over me, I felt a warm, delightful feeling.

"It is n't possible," said I aloud, but all to myself, "it is n't possible that little White Foot, the deer mouse, has moved into the old robin's nest and fitted it up with a peaked roof for the winter."

And the thought of it started the warm, delightful feeling again inside of me and all over me; and, snatching up the tongs by the fireplace, I ran out into the January rain that was falling down, down, down, in the dreariest sort of a way, and tapped a few times on the slender hickory sapling.

What happened? Just what I hoped would happen — a little sniffling snout with winking whiskers on it was stuck inquiringly out of a little round hole in the side of the nest, and White Foot looked down sleepily at me, and said:

"What in the name of the north wind is the matter below there? Don't you know that I sleep all day and all night too when it rains in this miserable fashion? Kindly go back to your fireplace and use those tongs to stir up the coals. I want to get back into my furry cozy bed and toast my toes and take another nap"— and in he went, too!

In I went, too, and stirred up my fire and toasted my toes, and in fact got warm and cheerful all over, thinking of little White Foot in his newly thatched robin's nest, where he was safe from prowling enemies and warm no matter how the wind blew.

THE MUSKRAT'S LODGE

Or, if you do not find White Foot, look out for the muskrats that by early October are building their winter lodges in the meadow.

I used to visit a village of "rat" houses at the head of Lupton's Pond, another small pond not far from my boyhood home. I have watched the "mussies," as we boys called them, through the coldest weather, and cannot believe that one of them was ever touched by the teeth of the frost.

These houses are very simple. If you will lift the top off an ordinary meadow lodge (you will have to do it before the top freezes on) you will find a single room, or one big bed, and at least one entrance and one exit which are always closed on the outside or bottom side by water.

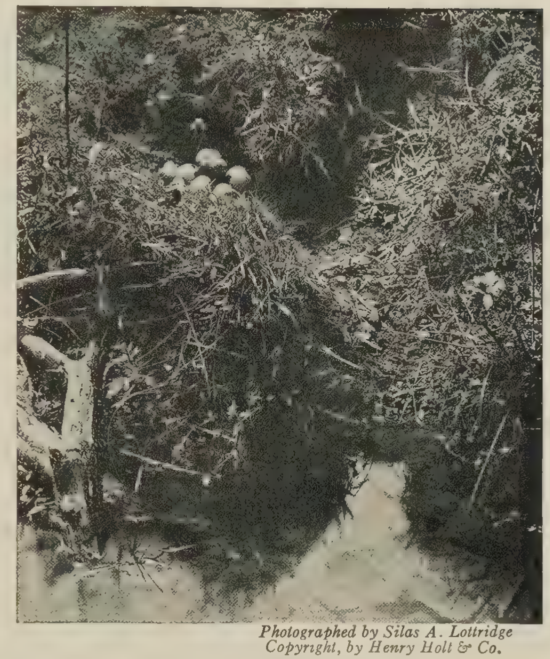
In building the *meadow* lodge, the muskrat first chooses a large tussock of sedge that stands well out of the water. This is for his bedstead. Now, from a foundation below the water, thick walls of mud and grass are laid up inclosing the tussock; a thatch of excessive thickness is put on for a roof; the channels leading away from the doors are dug out and deepened; a bunch of soaking grass is brought in and made into a bed on the tussock — and the muskrat takes possession.

The pond lodges at the head of Lupton's are made much after this fashion, only they are much larger, and are not raised about a tussock of sedge, but are built upon, and inclose, a part of a log or stump.

This lodge life is surely a cozy, jolly way of passing the winter, and it may change your whole feeling for the winter to sit down on the top of such a cabin some cold day and think of its warm life inside.

The possums are inclined to club together whenever they can find stumps that are roomy enough, but the muskrats habitually live together through the winter. Here, in their single-room house, one after another will come, until the walls can hold no more; and, curling up after their night of foraging, they will spend the frigid days blissfully rolled into one warm ball of dreamful sleep. Let it blow and snow and freeze outside; there are six inches of mud-and-reed wall around them, and, wrapped deep in rich, warm fur, they hear nothing of the blizzard and care nothing for the cold.

The snow has drifted over their house till only a tiny mound appears; the ice has sealed the pond and locked their home against the storm and desolation without; but their main roadway is below the drifting snow, and they know where, among the stumps and buttonbushes, the warm-nosed watchers have kept breathing holes open; for it is said that during the coldest weather a muskrat is stationed, or stations himself, at some place along their roads to keep an open breathing hole through the ice by the warmth of his nose. The ice maker never finds their inner stair; its secret door opens into deep, under-water paths, which run all over the bottom of the unfrozen pond world.



Photographed by Silas A. Lottridge
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THE MUSKRAT'S LODGE

Opened, showing entrance from the water, and apples stored for winter use.

Unless roused by the sharp thrust of your hockey stick, the muskrats will sleep till nightfall. You may skate around the lodge and even sit down upon it without waking the sleepers; but plunge your polo stick through the top, and you will hear a smothered *plunk*, *plunk*, *plunk*, as one after another dives out of bed into the water below.[1]

MOLLY COTTONTAIL'S BED OR "SQUAT"

In New England the little brown rabbit burrows in the ground in as warm a bed as anyone could wish; but farther south, no farther south indeed than New Jersey, the same rabbit has nothing for a winter bed but a squat or "form" (there is no form to it, however) right out in the open fields or in a fence corner

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[1] From "Wild Life near Home."

WINTER BED OF NORTHERN HARE

or under an old rail pile. As Molly is found over almost the whole country, you can all take a winter tramp to find out her form — and if possible see her sitting, "stiff," "frozen" (not actually), beside a corn butt, maybe, with snow sifted over her brown coat, hoping that by keeping still she may escape your keen eye.

Occasionally a rabbit will have two or three squats located over his range, each one so placed that a wide view on every side may be had. If it is along the woods, then he sits facing the open fields, with his ears laid back toward the trees. He can hear as far as he can see, and his nose tells him who is coming up the wind sooner than either eyes or ears.

It is cold, lonely living here in the winter. Everybody, except the mice and little birds, are enemies, his only friends being his wits and legs. In the long run, wits and legs are pretty safe insurance. "He who fights and runs away will live to fight another day," is Bunny's precept — and it works well; he still thrives.

The squat is a cold place. The sky is its roof, and its only protection is the tuft of grass, the stone, or the stump beside which it is placed. Bunny may change to the lee or windward side, as suits him, during a storm; but usually he keeps his place and lies close to the ground, no matter how the wind blows or how fiercely falls the rain or snow. I have frequently started them from their squats in bleak, wind-swept fields, when the little brown things were completely snowed under.

GLARE ICE

Another trip that I try to take every winter, although I have to watch sharp for it, is that to the mill pond when a clean, clear window-pane of glare ice has been laid over its surface. Don't you take your skates along, for the temptation to snap them on and cut a lady's chain or carve your name upon such ice is more than human nature can stand, no matter how much such nature may love the little fishes and the wonders of the under-water pond world.

Take a thick woolen sweater to lie on, and going early to the pond you are most familiar with, on a bright day, before any skater arrives, lie flat upon the clear, "black" ice and study the bottom of the pond and the fish that swim below you. They have boats with glass bottoms along the California coast, through which to watch the marvelous bottoms offshore. But an Eastern pond covered with glare ice is as good as a plate-glass window into the California wonder world.

Only you of the north can do this, except on rare occasions. I have often had the pleasure as a boy in New Jersey; and even now, when word reaches me that glare ice covers the pond, I am off for a look through the window at "what swimmeth below."

THE WINTER BIRDS

Here is a list of the commoner birds you can expect to find during the winter: Screech owl, crow, robin, flicker, jay, goldfinch, tree sparrow, English sparrow, song sparrow, junco, golden-crowned kinglet, nuthatch, brown creeper, hairy woodpecker, downy woodpecker, pine grosbeak, quail, partridge, shrike.

Now take more than one trip out to the fields and woods for the sake of learning these by sight — by sound too, and by flight.

Winter is the best season to begin your bird study, because the few species that you will find by reason of their fewness can easily be identified. If you wait until June you will be swamped by numbers and by the multitude of life in its myriad forms about you. The *beginner* ought to start in the winter to learn *how*, as well as to learn the birds themselves.

With a good bird book at home such as Chapman's, or a little one such as Reed's "Birds of Eastern North America" in your coat pocket, follow up the first bird you see until you get clearly in mind his chirp or call; something peculiar about his flight — a flirt of the tail, a habit of flying down to the ground in getting away; his size, color — white bar on wings, small spots or large clear spots on breast. Then come back to your book and identify him *from memory*. If you cannot, then go out again and again, and it will not be long before either this first one, or others, will be accurately made out — the beginning of an acquaintance that you can extend in the summer, but which will be sufficiently long for your first work in the woods among the birds.

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JACKDAW

AN IDEAL CHRISTMAS

If possible take your Christmas holiday in the open — half of it, at least. Make a practice of getting out on all your holidays, and you will be amazed at how much territory you will cover and how much you will come to know. There is likely to be no day of greater interest in all the year than Christmas Day.

The weather need not be considered. It is not likely to rain; and if it blows you can hear the great voices of the winter — the voice of the north wind, the voice of a pine forest, the voice of the surf on a stormy shore. There is no music that I know like the wild, mighty music of the winter winds in the winter woods. It will often happen that you can pass through a bare stretch of naked hardwoods immediately into a grove of thick-limbed spruces or pines. Never miss such an opportunity. Do not let the high winds of this winter blow on and away without your hearing them — at least once — as they sweep through the hardwoods into the resounding pines.

If it snows you can follow the trails of the wood folk, and if a quiet settles over the woods, as there often does after a soft snowfall, then you may listen to some of the large and healing silences of the winter.

Or, if the sun shines on a new snow, then, seeking some briery, sheltered hillside along whose top runs an old worm fence, you may find out that the birds are having a Christmas dinner quite as rich and varied as yours, for here in the sheltered warmth are great numbers of berry-laden bushes — no lack of either abundance or variety on this Christmas table!

See the bunches of withering chicken, or frost, grapes, plump clusters of blue-black berries of the greenbrier, and limbs of the smooth winterberry bending with their flaming

Courtesy of Boston Society of Natural History

WINTER BIRD RESIDENTS AND VISITORS FROM THE NORTH

See diagram on opposite page.

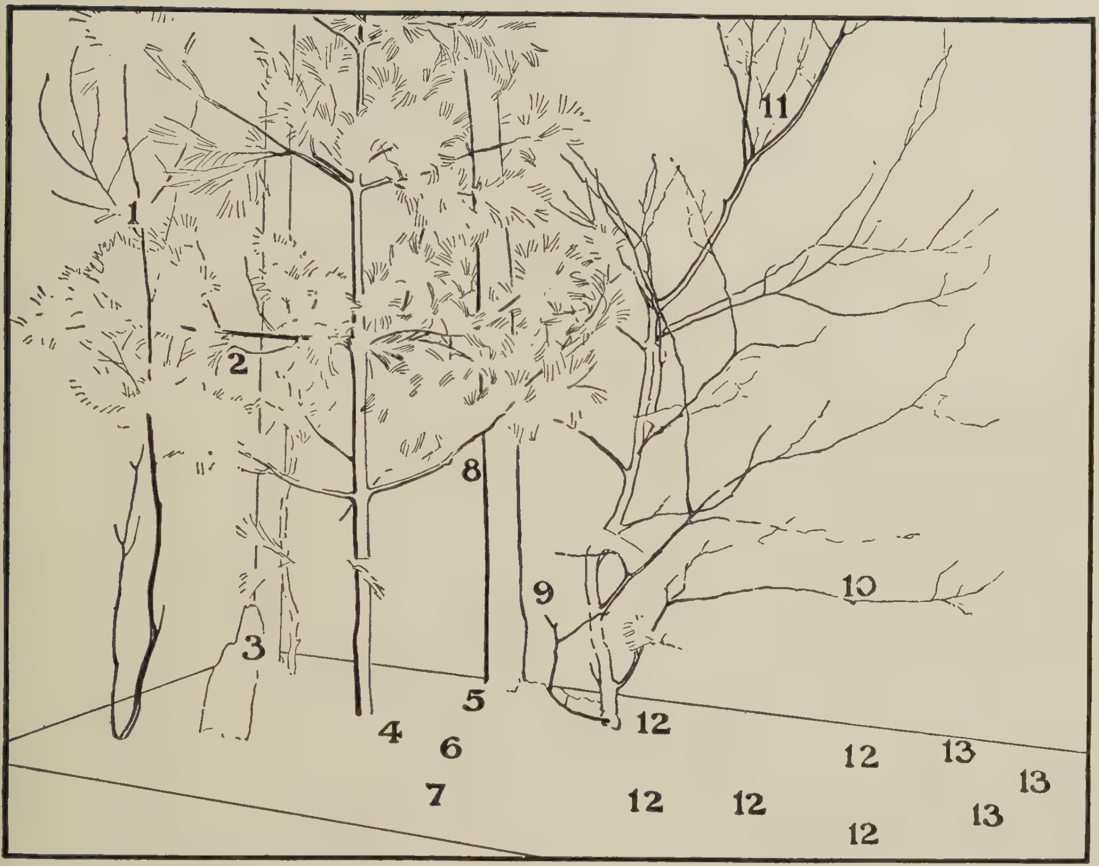
fruit. There are bushes of crimson ilex, too, trees of fruiting dogwood and holly, cedars in berry, dwarf sumac and seedy sedges, while patches on the hill slopes uncovered by the sun are spread with trailing partridge berry and the coral-fruited wintergreen. You have eaten part of your dinner with friends at home; now pick a quantity of these wintergreen berries and continue your meal with the birds, for they now have enough and to spare.

THE FACE OF YOUR FIELDS

Winter is the time to see your own hills and dales, your ridges and levels — just what the real shape of your neighborhood or haunt really is. Did you ever look far into your familiar woods in winter and see mounds and dips, rolling slopes and holes that you did not know before were there?

Many a time a winter walk has brought me to spots, familiar enough in the robes of summer, but so little seen in their real shapes as to be utterly strange to me now. I have often wondered if I were going right, whether or not I had lost my way.

Make a trip or two, then, to study the face of the ground — the ridges, hollows, level places, the ledges, meadows, sandbanks, the course of the streams, the location of the springs — the general shape and contour, the pitch and slant and make-up, of the region over which you tramp in the summer. Now, when the leaves are off and things swept bare, you



1. Black-capped chickadee. 2. Ruby-crowned kinglet. 3. Downy woodpecker. 4. Tree sparrow. 5. Junco. 6. American crossbill. 7. Junco. 8. White-breasted nuthatch. 9. Junco. 10. Redpoll. 11. Myrtle warbler. 12. Snow bunting. 13. Horned lark.

can get a general idea of the lay of the land that will greatly aid you in your more detailed study of plants and birds, of individual things, in the summer. It is like an outline map in geography.

THE BREAK-UP

If you live near a river or can get out to the low-lying meadows or down to the shore, when the great thaw or spring freshet is on, you ought surely to go.

The interest and excitement of a January or February thaw depend upon its size, and that depends upon the degree of frost prevailing during the months previous. If December is mild, with little or no snow, then the still milder weather after New Year's will produce no very marked effect. It sometimes happens that there is considerable snow and a firmly frozen river in December, and then the typical thaw terminates with a midwinter freshet, often disastrous, it is true, but sure to open up a charming new world to the outdoor naturalist.

"Along the river, and in every pent valley of the smaller creeks," says Dr. C. C. Abbott, "is enacted an exciting drama. Animal life, that long since withdrew into snug quarters to await the coming spring, or had cozy retreats from tempestuous weather and ventured abroad only when the day or night was fair, is alike now turned out of house and home and put to its wits' ends to find a place of safety.

"Occasionally I have known a hollow, globular nest of closely matted grass, filled with the tightly curled body of a soundly sleeping jumping mouse, to roll from the crumbling bank of a creek, and, as it was borne along toward the river, the occupant to be roused by the encroaching water. One such poor creature was plucky and struggled bravely to reach the shore, but only to find its strength exhausted, and my subsequent careful nursing could not save its life. There is no staying power in these little bodies to withstand so great a change, and I am surprised that they should ever rouse from a torpid condition under such circumstances.

"Very different is it, however, with the omnipresent meadow mice. They bob up serenely to the surface when the flood covers their grassy runways, and, swimming with ease, spend their time in voyages of discovery, making every floating object that will sustain their weight a port. When you approach them, they await your coming until nearly within your reach, and then dive abruptly, sinking from sight as though suddenly turned to lead. On the other hand, the poor shrews, although not timid when about the water in summer, and active enough in winter when their coats are dry, find the current too swift and bewildering, and often succumb after swimming a few rods.

"The reptile world at this time is represented by the familiar water snakes, and they too are well worthy of a moment's notice. All know, I presume, how sensitive to cold are serpents generally. This species is one, at least, that is not helpless when plunged into icy waters, and has no idea of soaking to death when a January thaw submerges its winter quarters. Why they are disturbed by it at all I do not know, for they hibernate in mud and not in dry earth. However, the freshet brings many to the surface, and their activity adds to the attractiveness of the flooded meadows. They are not so quick-motioned as in midsummer, but rarely are caught napping, even by the wary crows, which enjoy harassing them upon every occasion, yet never, or very seldom, kill and devour them.

"Insect life likewise is roused from its slumbers, and probably no time is so favorable to gather beetles as when they are floated to the shore by the rising waters. I have seen the meadow margin lined with them, and hundreds of specimens could be gathered of species rarely to be found at any other time.

"All predatory animals that withstand the rigor of winter look upon the January thaw as their annual jubilee. Minks, muskrats, hawks, and crows particularly, are ever on the alert for the benumbed mice, snakes, turtles, and insects that are now, if not helpless, at least at a great disadvantage. All day long they are prowling along the shores of the new-born lake and congregate on the little islands that are formed by the knolls. While eager to prey, they are mindful that their arch-enemy, man, may prey upon them; so they keep out of sight when danger threatens, and the naturalist must be cautious indeed as he rambles over the submerged meadows. But, if so, then every moment will prove precious and no day too long, and, if the day is followed by a moonlight night, then will his cup of happiness be filled to the very brim."[1]

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[1] By permission of D. Appleton & Co.

SKUNKS

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AFIELD WITH THE FLOWERS AND TREES

"I often think, when working over my plants, of what Linnæus once said of the unfolding of a blossom: 'I saw God in His glory passing near me and bowed my head in worship.' The scientific aspect of the same thought has been put into words by Tennyson:

> "'Flower in the crannied wall
> I pluck you out of the crannies,
> I hold you here, root and all, in my hand
> Little flower, — but if I could understand
> What you are, root and all, and all in all,
> I should know what God and man is.'

"No deeper thought was ever uttered by poet. For in this world of plants, which, with its magician, chlorophyll, conjuring with sunbeams, is ceaselessly at work bringing life out of death,— in this quiet vegetable world we may find the elementary principles of all life in almost visible operation."—John Fiske in "Through Nature to God."

"There is much speculation as to why flowers ever came into the world or what necessary utility they are to plants. But we are free to accept a fact; and flowers are facts. I think there must be something more than mere utility to the plant that brought blossoms into existence. But why ever they came, they are joyful things and they are parts in the journey in life. To know a flower well and to grow it well are more than botany and gardening. The songs of birds, the feel of winds, the flow of streams, the appeal of flowers, are so real that we are likely to forget them or to lose them; but the flowers excel them all in the ease and completeness with which we may adapt them to personal needs and incorporate them into a process of life." — Liberty H. Bailey.

THE FIRST TRAMP AFIELD FOR FLOWERS

I HAVE just come in from a tramp across the February fields — fields all flat, washed-out, frozen and forlorn; and I have brought back with me from those fields a handful of promises — a withe of pussy willow, already escaped from its winter scales, and silvery with the light of spring; and, with the willow, a crooked little stem of arbutus, its pointed buds still sheathed in green, but showing in their tips the faint suggestion of pink-white petals, soon to open with as pure and sweet a kiss as ever lover had.

I stood upon the ice in a wide, shallow pond, to cut the willow; I dug through the matted, frozen oak leaves on a wooded hillside, to pick the arbutus — eagerly, almost fearfully, lest something had gone wrong with the world, and the promise had been withheld, and the winter had come to stay forever! But there were the green leaves and the swelling buds — the pledge still good; and back to me came lines that I had written in an earlier February:

Dead! Ah no! The white fields sleep,
  The frozen rivers flow;
And Summer's myriad seed hearts beat
  Within this breast of snow.

With Spring's first green the holly glows
  And flame of Autumn late, —
The embers of the Summer warm
  In Winter's roaring grate.

And as I held these embers of autumn with the cold ashes of winter in my hands, the flame of springtime kindled in my spirit and set all the woods afire.

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SPICEBUSH

There is no other single influence in the world of Nature so subtle, so powerful, so all-pervading as the influence of flowers. Some of us still believe in the stars, charting life by the constellations, but all of us yield to the divinity in flowers. More and more of us, with glass in hand, go afield for the birds; but all of us come home with a handful of blossoms.

Soon — when the April sun stands warm in the sky — I shall see ones and twos, and troops of young and old, streaming out into these neighbor woods of mine for windflowers, hepaticas, arbutus, and violets. From office and school and factory they will come, native and foreign. And on the street, throughout every quarter of yonder city, I shall soon see in doorways, alleys, corners, and along the curbs, tight, naked bunches of arbutus, stripped of all but the pink of their faces and the sweet of their souls — being sold by Jew and Gentile, and being bought by Greek and Barbarian as no other gift of the year, no other essence of the spring, is bought and sold.

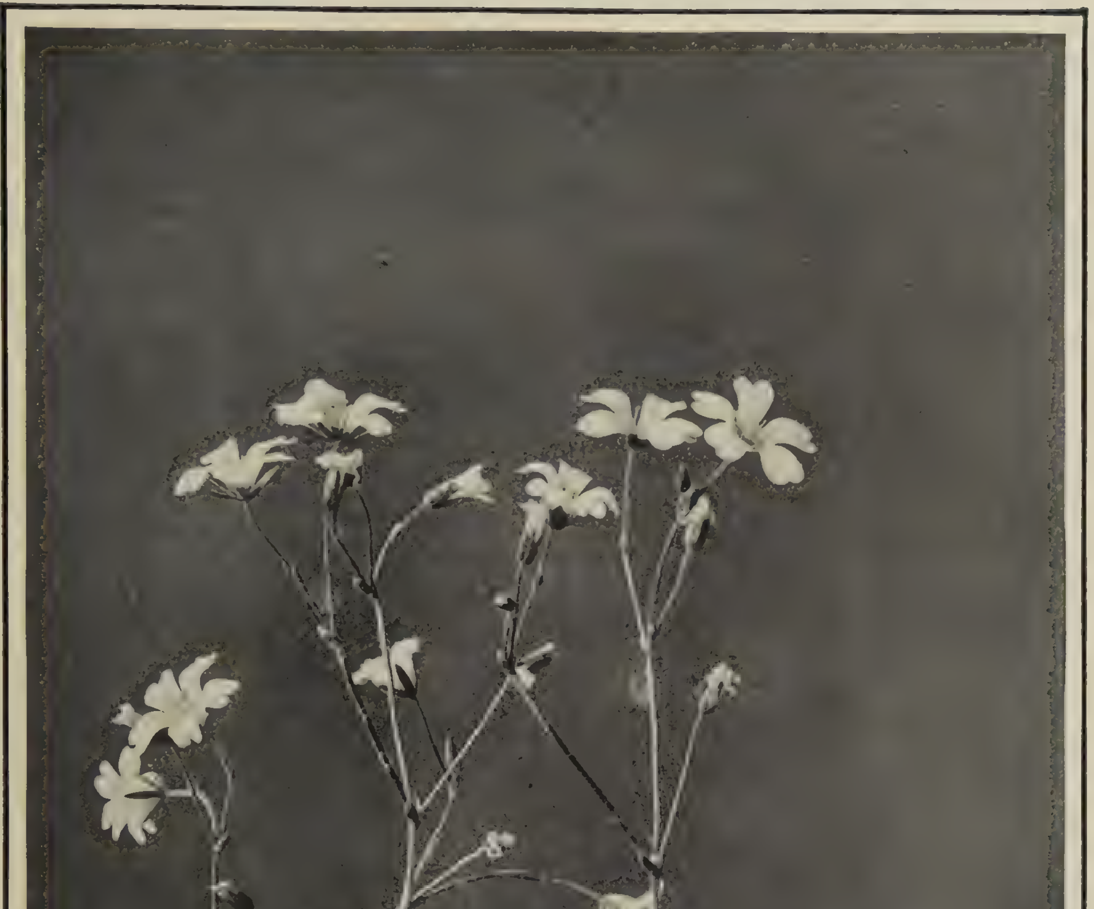
Do you know where to find arbutus, or whatever your earliest flower may be? Many of you can go out in February and find the woods full of blossoms — but not if you live, as I do, in cold New England.

But I do not have to wait until the arbutus opens for my first blossom — only until next month; for I know where to find a spicebush abloom in March. But not even until next month need I wait, for these buds of the willow and arbutus will open for me here in the sunshine of the room.

The fires of summer are never out. They are only banked in the winter, smoldering always in the flower buds asleep beneath the snow. And the fires of hope for the human race are never out — not so long as the love of flowers smolders, as surely it does, in every human heart, ready to brighten and burst into burning even in the dreariest of lives, if only the snowdrifts will melt and let in a breath of spring.

But I have an earlier flower than the little doubled-up fists of the spicebush, and that is the chickweed.

Now flowers are arranged scientifically in books, according to their families; or, more popularly, according to season and color. I shall arrange these few according to season and according to locality — telling you *where* to find them. If every reader of this book comes through the summer, or the next five summers, knowing the flowers and trees and other common plant forms mentioned here, he will be fairly well acquainted with the plant life in the fields and woods. Again, of course, our localities differ. You are living in California or British Columbia or Florida and I am here in the little old Bay State of Massachusetts, and of course, again, I will write of my flowers while you will go out and find *your* flowers, not one of which may be mentioned here. But even so it is important for you to know my flowers, for they will be the common, familiar ones and hence those that have long since taken a large place in story and song. You know Emerson's poem on the rhodora? Do you know the flower? You know the beautiful poem, "The Death of



FIELD MOUSE-EAR CHICKWEED (*Cerastium arvense*) the Flowers." Do you know those flowers mentioned there?

Now let us get back to the chickweed. There are two of them — the broad-leaved, and the long, narrow-leaved stitchwort. They often grow together, and all summer long — all the year round, indeed, when not too cold — you will find big, sprawling, matted messes of it with tiny, fine white flowers.

It is the 21st of March; the sun has crossed the line, the phœbes have returned; and here under the straw in the garden the chickweed — *starwort* — first of the flowers, is in blossom!

No, this is not the first sign of spring; but with me it is the first blossom.

This is the last day of winter. Cold? Yes, it is cold, raw, wretched, gloomy, with snow still in the woods, with frost still in the ground, and with not a frog or hyla anywhere to be heard. But come along. This is the last day of winter — of winter? No, no, it is the first day of spring. Robins back, phœbes back; water-cress for the table, chickweed in blossom.

The old almanac is mixed again. It always is. Who is Who in the seasons when flowers are blooming on the 21st day of March?

But shall we go back and wait, seeing that you have a touch of rheumatism?

Now I am going to let my dear friend James Buckham take you — for I have a touch of rheumatism. Do you know James Buckham, one of the sweetest, sincerest, most delightful of Nature writers? "The rain is falling where he lies," out in the earth he loved; but here is a chapter from his book "Where Town and Country Meet," and you will never take a more charming tramp into the fields, cold as they are, than in this chapter, "An Early Spring Walk."

AN EARLY SPRING WALK

"At noon, yesterday, April 7, as I was crossing the town common, I got the first smell of the soil — that indescribably fresh, damp odor that thrills all one's nerves as with the very touch of spring. Here and there huge snow banks were still lying, dirty and ragged, like mammoth cattle that had 'wintered out'; and the light breeze blowing from the north had the tang of frost in it yet. But I could not resist that intoxicating odor of the earth. It waked something in my heart as restless and wild and undaunted as the sprout of the frost-breaking crocus, and I perforce dedicated the rest of the day to the fields and wood edges.

"Immediately after dinner — the New Englander's good old-fashioned noonday dinner — I was off across the pastures to the eastward, my rubber boots splashing through the puddles of snow water that still sparkled in little hollows of the frost-bound soil. The sun lay warm and cheery over all the landscape, and the breeze had just enough frost in it to be delicious to the nostrils, as well as bracing. The song sparrows were lifting up their sweet thankofferings everywhere, by altars of bush and stone, and now and then I heard the clarion of the robin from some neighboring orchard. On a fence post sat a solitary bluebird, but he was silent — depressed, apparently, at having arrived so long before his fellows. It would be some days yet, I imagined, before I should hear his jubilant strain.

"Straggling crows were drifting southward, overhead, scolding me with harsh, suspicious caws. The crow is the most "canny" and sophisticated of all our wild birds. He suspects all mankind, and even womankind, of carrying guns up their sleeves, and being banded in a perpetual league to lay him low. No range, however long, seems to promise him immunity from the deadly bullet, and he starts his hoarse alarmist cry if he spies a human figure a mile away.

"Before I came to the edge of the woods I was in a glow from exercise, and the blood coursed in my veins like liquid fire. It was a part of the natural exhilaration of all life at the return of the spring. I feel it distinctly every season — this rejuvenation and reënforcement of all my vital powers and functions. It is as pronounced with me as with the plants and the trees; a flooding upward and outward to the very finger tips and pores of the scalp of the sap of life; a vernal flood tide of health and energy and hope and delight in existence.

"All animals, I think, feel it more or less, and all men in proportion as they share the life of Nature and are in sympathy and communion with her. Farmers, hunters, boatmen, explorers, surveyors, ramblers — these out-of-door men know what is meant by the exalta-

SKUNK CABBAGE, WITH LEAVES UNFOLDING

tion and exhilaration of the spring. They have all felt this rushing vernal sap in their veins, and that transporting thrill, which seems to exude at last in a fine spray from every extremity. Even up to old age such men renew their boyhood every spring. Their hearts swell within them; their muscles grow elastic and tireless, so that they seem to walk on air; their bodies glow and palpitate, and their spirits respond to all bird songs and brook music. It is the universal, perpetual rejuvenation of the spring; and so long as we can share it, we are not old, but still belong to the youth and enthusiasm and fecundity of Nature.

"Even so early as the first week in April, with frost still lingering in the open fields and snow littering the woods to their very edges, the first rambler of the season will find some few hardy wild flowers, either with half-open buds or in brave full bloom. I saw, on this crisp April day, even before I came to the southward-sloping bank beneath the woods, what looked like a delicate mat of ladies' veils, or a gigantic iridescent spider's web spread out in the sun, and knew it to be a densely clustered bed of the grayish-blue Houstonia, or bluets. There they trembled in the wind, those exquisite frail flowers, like little mouse ears raised aloft on swaying stalks. How fragile! At a little distance they looked like a puff of smoke that the wind must presently drive away. And yet they are so hardy as to survive frosts and even late snowstorms. I have pulled them out of the snow, as fresh and unwilted and shining as the hour they broke the sod. Indeed, nearly all the early spring flowers are noticeably delicate in texture and fragile and dainty in form. The coarser, apparently stronger, flowers come later. It is one of those paradoxes of which inscrutable Nature is so fond. She loves to astonish us by sending up her whitest lily out of the black mire, and setting her most fragile, babylike flowers on the edge of a snow bank.

"I picked some of the most vividly pink arbutus blossoms, on this same afternoon, along the edge of the woods. None so fragrant and so richly tinted will be found later. The pure white blossoms predominate as the season advances, larger and creamier and more cloyingly sweet in perfume than the pink firstlings, but not so delicate, so blushingly beautiful, and so spicily fragrant. I found also a few tiny golden saucers of cinquefoil, timid and pinched, as if regretful of having opened so soon.

"Every run I crossed, and every swampy place under the edge of the woods, had from two to a dozen of the sharp-pointed, purplish spathes of the skunk cabbage thrusting up through the wet soil. The hood of the spathe had, since it first broke the ground in March, lifted visibly, and the sides expanded, bulging outward, so as to reveal the small, pale clusters of minute flowers, protected until now by the warm-colored and tightly closed blanket of the spathe.

"Almost constantly, as I strolled along the edge of the woods, I could hear the silvery chimes of the hylas, those tiny wood frogs which inhabit the pools and marshes, and jingle their strings of sleigh bells (for the music, at a little distance, sounds exactly like sleigh bells) from the first of April until the middle of May.

There is no sound, to me, so delightful, so suggestive, so characteristic and typical of early spring, as the chirping of the hylas. It unites the early and the later season, for it has a tinkle like the dripping and clashing of icicles and a melodious, flowing music like released brooks and the voices of birds. I should feel lost and desolate without my sleigh bells in the spring. The first pipe of the hyla is more delicious to me than a whisper from Remenyi's violin, and when there comes an answer, gradually swelling into an irregular, vibrant chorus, my heart tastes again, for a little while, the unnamable ecstasy of childhood, and I can believe that I am standing once more on the morning threshold of the world.

"Every sight and sound and odor of the early spring seem to possess a peculiar significance and charm, such as is revealed to the lover of Nature at no other season of the year. All reports of the senses teem with freshness, newness, pungency, promise.

"'The year 's at the spring,'

sings Browning; and in that single line he conveys an almost overwhelming sense of the fullness of life, hope, joy, energy, courage, determination. Just as there is one day in every month when the sea floods up irresistibly and touches its highest tide mark, so there is one month in the year when the life of Nature climbs to its maximum, and thrills the whole world with a sense of vital repletion and power. April is the month of all months to go rambling, for one's health of body and mind, because it is then we may embark upon that mysterious flood tide of reviving Nature, and share the exaltation and exhilaration of all organic and sentient life. Before the grass is green on the hills or the mist of early leafage dims the swamp, take your stout staff, rambler, and go afield. Then, though your hair be gray, you will find yourself wandering blissfully back to boyhood, and standing again on some sunrise hill, with the whole world swimming in morning gold beneath your feet."

I now add to this first bouquet a bunch of marsh marigold, claytonia, and a handful of the little mouse-eared everlastings or Indian tobacco, and you have reward enough for all the slush and cold.

LATE IN APRIL

COME now with me for a tramp over these Hingham hills — not hills really but gravelly, glacial ridges with outcropping granite ledges and swamps strewn with bowlders. It is still raw and chilly, for spring is slow in New England, and I cannot get used to the two weeks of difference between here and my boyhood home in New Jersey.

From far and near the knowing ones come to my little wood lot for the blue hepatica or liverwort (so named because the leaves are liver-shaped) — *Hepatica triloba.* It belongs to the crowfoot family.

"The flowers rise direct from their fibrous roots, and the bud and stem are thickly covered with very fine, fuzzy hairs, which have been likened unto a fur overcoat, intended to protect them from the cold.

"The blossom of the hepatica has no petals. Its six to twelve delicate, colored, oblong sepals

PINK HEPATICA (*Hepatica triloba*)

may easily be mistaken for them as they are closely supported by three small, oval hairy, reddish-green leaflets which at the same time, might be mistaken for the calyx. Solitary flowers are borne on slender hairy stems some three to five inches in height. They are less than an inch broad, and exhale a delicate fragrance, although the odor is by no means constant. The blossom closes at night. The numerous greenish pistils and yellowish, hairlike anther-bearing stamens are prettily clustered in the center. The general color of the blossoms varies from blue, lavender, and pink to white."[1]

It is strange the notions that plants exhibit. The chickweed will grow in damp land anywhere and in all weather. You can't kill some plants; while others you can scarcely keep alive. The hepatica and the arbutus grow where they grow — here, there — and not again for a hundred miles! Some time ago I was in the depths of a forest two hundred miles wide, through which a railroad had just been cut, and there among the bleeding fir stumps were daisies, the "whiteweed," in bloom! Why, they must have been in the surveyor's shoes to have come into blossom so soon.

The Dandelion. Here is one of the common folk of the flower world—"just as common as dirt"; but "dirt" among the miners is the name for *gold!* Isn't it always so to the miner, no matter what he seeks? If you seek the beauty in the dandelion, you will find it. Think of the pure gold in Lowell's poem beginning:

> "Dear common flower that growest beside the way
> Fringing the dusty road with harmless gold."

The flowers of the dandelion are deceptive in their construction. They appear to be borne singly on the stems, in solitary, large flat heads; but if we look closer we see that each golden dandelion is a colony made up of tiny flowers brought into a compound head. What seems to be the flower is really a collection of flowers; what seems to be the green outside calyx is really a circle of bracts; and the yellow rays, which look like petals, each belong to individual florets crowded together on a disk.

After blossoming, the inner circle of bracts round the flower cluster closes, and the slender, narrow tip elongates and raises up the pappus, or seed down, while the fruit is forming. Afterward all the bracts turn back and expose the pappus in "a round, downy blowball."

This wonderful little blowball is easily shaken by the wind, which scatters the seeds with their small tufts of feathery down, and launches them like little airships on their journeys overhead. The delicate way in which the seeds are adapted to broadcast sowing by the wind accounts for the wide distribution of the dandelion up and down the world.

DANDELIONS

The last scene in the life of these flowers.

Cynthia is a very common native species and is found blooming from April until July in dry fields, open woods, or sandy soil from southern Canada to the Gulf.

The Rue Anemone. As dainty as the dandelion is coarse, the delicate anemones come out in this April weather and dance in the wind in every open spot on the sheltered wooded hillsides. Nymphs they are and delight to troop out together. How the poets have loved

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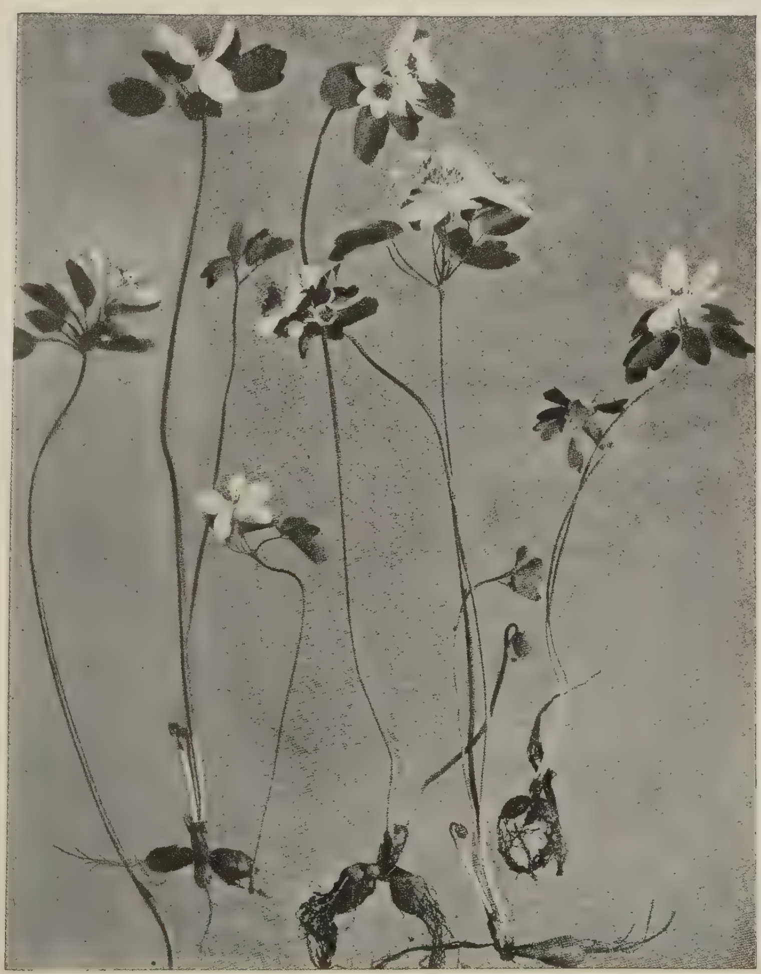
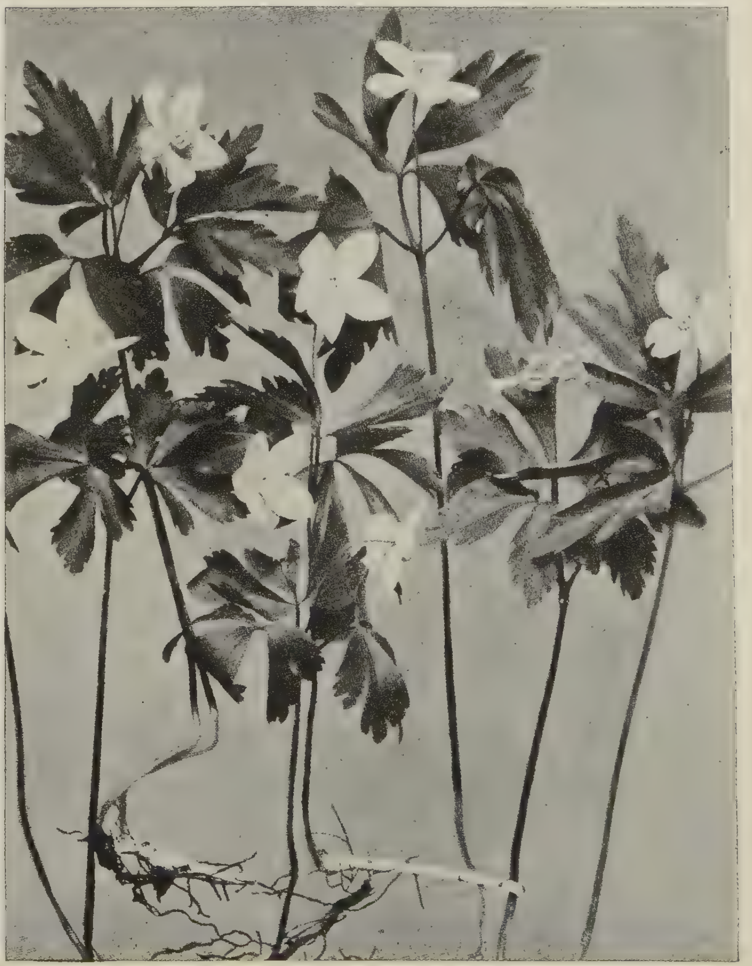
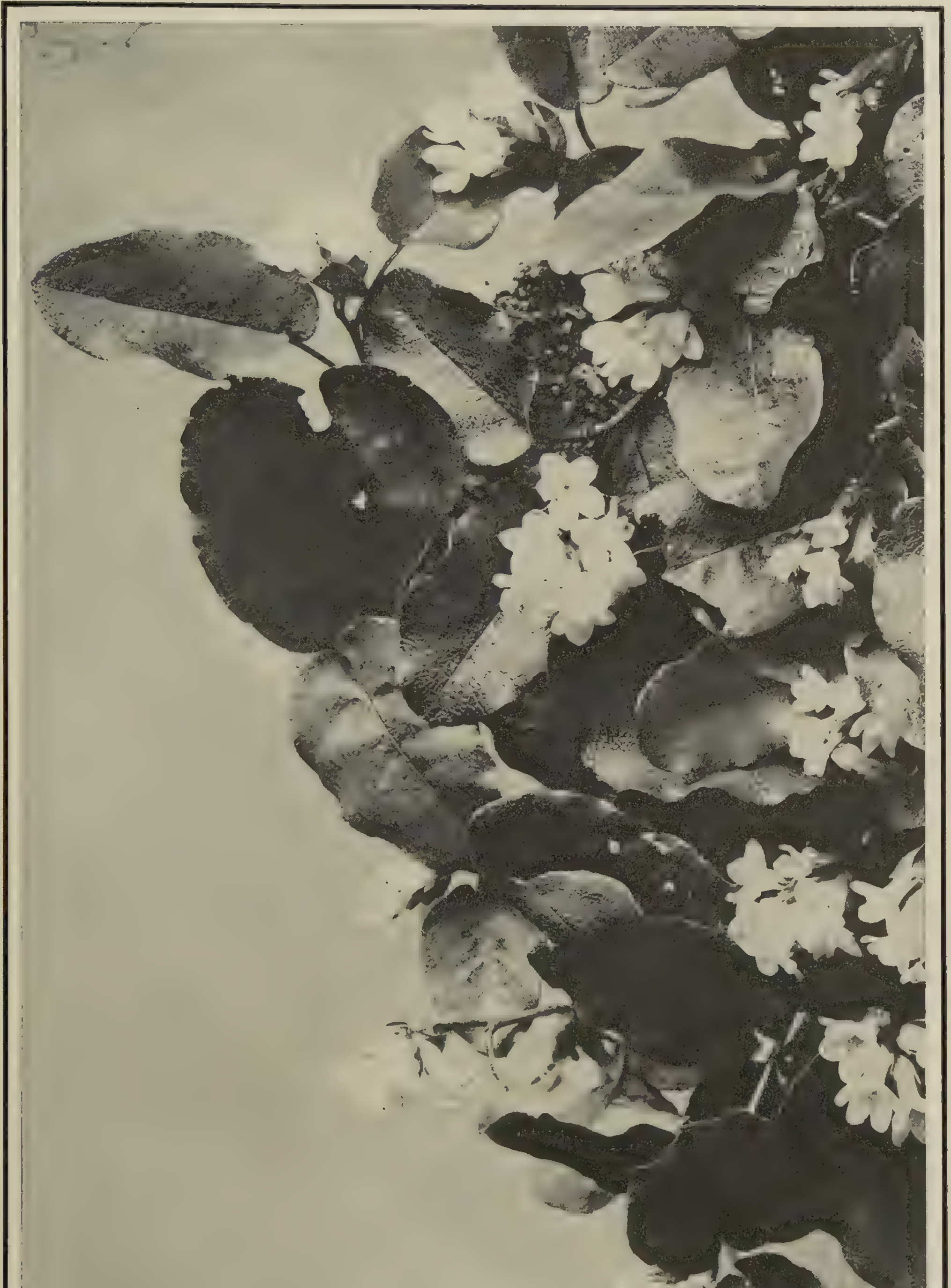
[1] "Wild Flowers Every Child Should Know," by F. W. Stack. By permission of Doubleday, Page & Co.



RUE ANEMONE (*Syndesmon thalictroides*)



WINDFLOWER OR WOOD ANEMONE (*Anemone quinquefolia*)



ARBUTUS OR MAYFLOWER (*Epigæa repens*)

the little things, partly for their names, I am sure.

> "The windflower and the violet, they perished long ago."

On page 60 is shown a picture of the *rue* anemone; don't confuse it with the wood anemone or windflower. "They bloom at the same time, and often grow side by side. The wood anemone has *one* flower and *one* rootstock, hence *wood-one;* while the rue anemone has *two or more* flowers and *two or more* root parts, hence, *rue-two*.

"The most striking difference between the wood and rue anemone is found in the roots. The former has a thick, horizontal rootstock, while the roots of the latter are formed of a small group of little bulbs, resembling tiny sweet potatoes. The perfect, white flower is sometimes tinted with pink. It is smaller than those of its cousin, the windflower, and, in common with them, it soon perishes after being plucked."[1]

The Star Flower. With the anemone (coming just a little later) I find the star flower. "Is any other blossom poised quite so airily above its whorl of leaves as the delicate, frosty-white little star flower? It is none of the anemone kin, of course, in spite of one of its misleading folk names: but only the windflower has a similar lightness and grace."[2]

Even a glance at the *many*-pointed star will be sufficient to distinguish it from the anemone.

Yellow Adder's-tongue. Passing in where the shadows lie and the brook bubbles over the tangled roots, you will find the yellow adder's-tongue.

"Colonies of these dainty little lilies, that so often grow beside leaping brooks where and when the trout hide, justify at least one of their names; but they have nothing in common with the violet or a dog's-tooth. Their faint fragrance rather suggests a tulip; and as for the bulb, which in some of the lily kin has toothlike scales, it is in this case a smooth, egg-shaped corm, producing little round offsets from its base.

"Much fault is also found with another name on the plea that the curiously mottled and delicately penciled leaves bring to mind, not a snake's tongue, but its skin, as they surely do. Whoever sees the sharp, purplish point of a young plant darting above ground in earliest spring, however, at once sees the fitting application of 'adder's-tongue.' But how few recognize their plant friends at all seasons of the year!

"Everyone must have noticed the abundance of low-growing spring flowers in deciduous woodlands, where, later in the year, after the leaves overhead cast their heavy shade, so few blossoms are to be found because their light is seriously diminished. The thrifty adder's-tongue, by laying up nourishment in its storeroom underground through the winter, is ready to send its leaves and flower upward to take advantage of the sunlight the still naked trees do not intercept, just as soon as the ground thaws."[2]

"The solitary, bright-yellow, bell-shaped, lilylike flowers hang downward, from long, slender, upright stems, and have a slight, delicate fragrance. It is the half-dozen rich, brown-capped, yellow stamens standing out gracefully from an equal number of recurved petal-like sepals that give the striking contrast and pleasing harmony to the flower. Inside, near the base, the divisions are sharply spotted with rich chocolate, and on the outside they are usually faintly tinged with purple."[1]

The Early Violets. What are the most loved of flowers? I used to know a little girl who could say "coffee jelly" with such a caressing little coo and so shaky a little gurgle as almost to make you taste the trembling dainty. I have always liked coffee jelly because I hear and see that little girl in it. Violets! You can't say the word without a caress, without the quality of love in your voice.

They come along with windflowers, the earliest of them in my fields being the tiny blue *Viola cuculata*, the "meadow" violet, which grows here on all the dry, warm hillsides, and is such a dwarf that you can hardly get one with a stem long enough to hold.

Viola lanceolata, and *Viola blanda*, the little white ones of the wet meadows, are first to appear in some places and are generally reckoned as the earliest of the family. A little later in the gravelly cuts I find *pedata*, the bird's-foot blue violet, then *sagittata*, the arrow-leaved violet, and rarest of all the downy yellow violet, *Viola pubescensis*, a large, very handsome violet, that prefers for its habitat dry, hilly woods, often by the side of rushing brooks, but not usually where the soil is moist.

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[1] "Wild Flowers Every Child Should Know."

[2] "Nature's Garden," by Neltje Blanchan.

VIOLETS (*Viola bicolor*) AND JACK-IN-THE-PULPIT

"The yellow violet is one of the tallest members of the family, its stem ranging from six to eighteen inches in length. Both the stems and the leaves are woolly-hairy. There are from two to four leaves growing from the stem near its summit; they are heart-shaped, pointed, and either toothed or scalloped. The flowers, rising on slender peduncles from the axils of the leaves, are rather large and bright yellow; the two lateral petals are heavily bearded, and the lower one is handsomely veined with purple. These beards compel visiting insects to brush against the stigma and then against the anthers before reaching the nectar in the short spur."[1]

> When the beechen buds begin to swell,
> And woods the bluebird's warble know,
> The yellow violet's modest bell
> Peeps from the last year's leaves below.
> WILLIAM CULLEN BRYANT.

The Saxifrage. "Early in March," says the author of "Wild Flowers Every Child Should Know," "the pretty little white flowers of the saxifrage blossom in numerous spreading groups, which are loosely clustered on the tops of long, thick, often sticky, hairy stems. This plant grows from four to twelve inches high and loves to dwell in dry or rocky hillsides and woodlands, where it usually roots in small chinks or crevices among the rocks. Its name is derived from the Greek, meaning 'rock breaker,' and alludes to its fabled power to rend apart the rocks where it is generally found growing."

But I never find it in my backward country as early as March. Indeed, it is only now and then that I get it *early* in April; but that is because I don't know where the early *rocks* lie — those so exposed that the south sun rests warm upon them before the leaves of the trees come out. Not rock breaker but winter breaker it ought to be called, or rather soul-of-the-spring.

Are we getting quite a handful? Remember that this is April, and if we really wanted to bring home everything to be found in blossom, from the catkins shaking dust-of-gold to the big, blooming worlds of garnet maple blossoms, it would take a chapter of pages to hold them.

The Spring Catkins. I can't have the space to do it here; but while we are on this April tramp let me suggest that you make a collection and close study with your botany and magnifying glass of the early catkins — pussy willow, yellow willow, alder, hazelnut — (may I stop *just* a moment to say that it is the catkin of the hazelnut that gives my bees their first spring pollen — bee bread! Before they get into the spathes of the skunk cabbage even they find the dusty catkins of the little hazelnut bushes and bring home from them the first "bread" for the spring broods).

Catkins, I was talking about. Make a study

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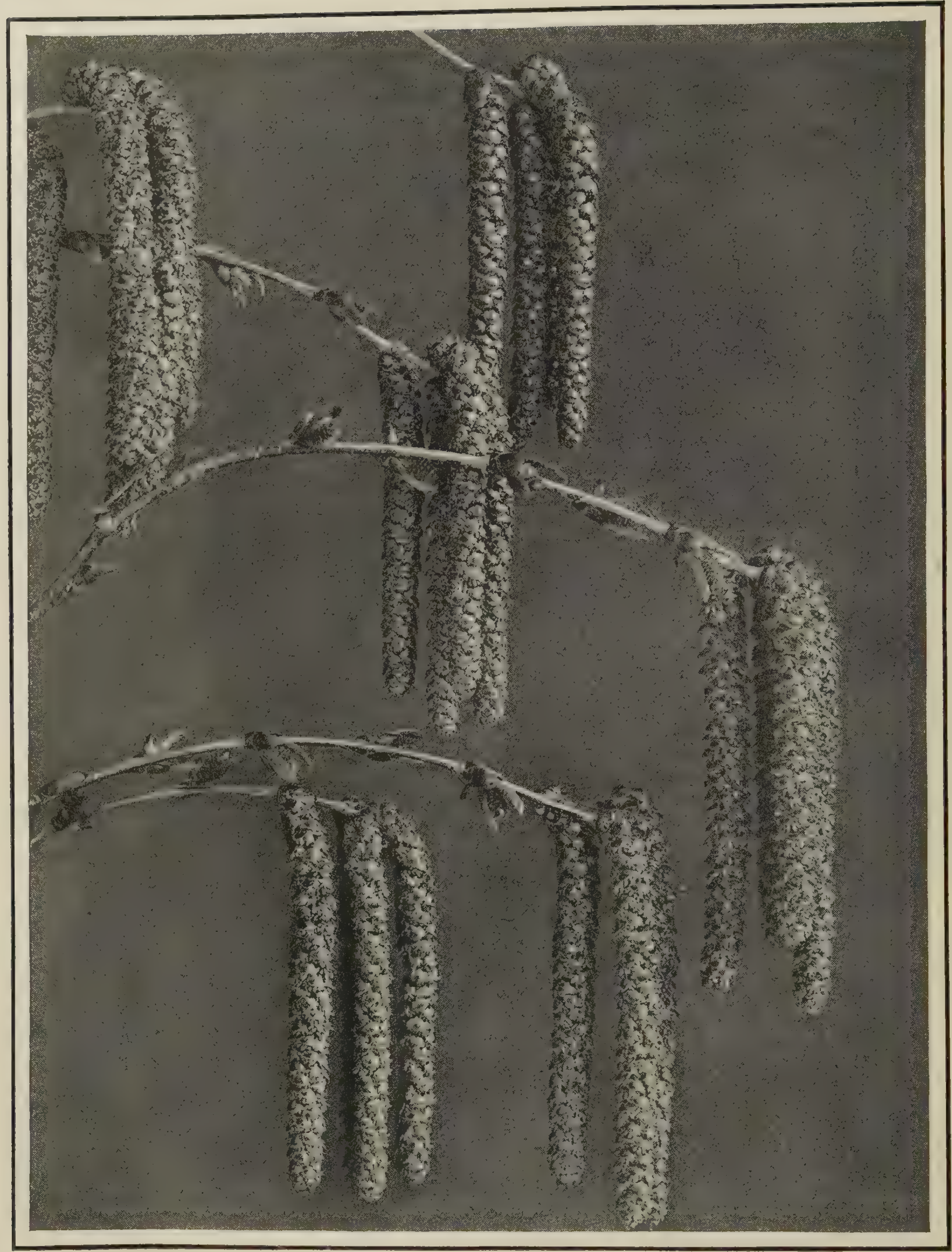
[1] "Flower Guide," by Chester A. Reed. By permission of Doubleday, Page & Co.



THE LONG GREEN CATKINS OF THE GRAY BIRCH

The catkins of the gray birch (*Betula lutea*) shake out their pollen in April. Scattered along the twigs you see the cone-shaped seed cases. These will ripen in autumn and scatter myriads of seeds over the snow, to the joy of the hungry winter birds.

of them. You will find them wonderfully made and minutely beautiful especially those big caterpillar ones on the balm-of-gilead poplars or the quaking aspen. But this opens up the whole study of trees, for a very multitude of them flower by catkins, as the oaks, hickories and poplars.

Claytonia, Spring Beauty. Does claytonia grow in your moist open woods? It is one of my sorrows that I cannot find it about me here. Says "Nature's Garden":

"Dainty clusters of these delicate starry blossoms, mostly turned in one direction, expand in the sunshine only, like their gaudy cousin the portulaca and the insignificant little yellow flowers of another relative, the ubiquitous, invincible, 'pussley' immortalized in 'My Summer in a Garden.' At night and during cloudy, stormy weather, when their benefactors are not flying, the claytonias economically close their petals to protect nectar and pollen from rain and pilferers. Pick them, the whole plant droops and the blossoms close with indignation; nor will any coaxing but a combination of hot water and sunshine induce them to open again. Theirs is a long beauty sleep. They are supersensitive exquisites, however hardy.

"Very early in the spring a race is run with the hepatica, arbutus, adder's-tongue, bloodroot, squirrel corn, and anemone for the honor of being the earliest wild flower; and although John Burroughs and Dr. Abbott have had the exceptional experience of finding the claytonia even before the hepatica—certainly the earliest spring blossom worthy of name in the Middle and New England states—of course the rank skunk cabbage whose name is snobbishly excluded from the list of fair competitors, has quietly opened dozens of minute florets in its incurved horn before the others have even started."

The Shadbush. I am actually writing these lines deep inside the four shadowy walls of my study with all the world asleep about me. Yet at the sight of that name of shadbush I am out in the April woods and I know that spring—real spring—has at last come; for yonder in the borders of the leafless trees I see a misty, foggy, wraithlike bush in blossom, as if a bit of vapor from the early morning had drifted in from the pond and been caught.

What does not the soft, blowing shadbush mean to me? Perhaps the something is in its name—because it links my inland round with the round of the sea; and because it links this present narrowing ground with the wide-winging round of the past.

At the sign of the shadbush I know the fish are running—the sturgeon up the Delaware; the shad into Cohansey Creek; and through Five-Forks Sluice, these soft, stirring nights, I know the catfish are slipping. Is there any boy now in Lupton's Meadows to watch them come, to listen in the moonlit quiet for the *splash, splash,* as the fish pass up through the main ditch toward the dam?

At the sign of the shadbush how swiftly the tides of life rise! how mysteriously their currents run—drifting, flying, flowing, creeping—colors, perfumes, forms, and voices—across the heavens, over the earth, and down the deep, dim aisles of the sea!

MAY!

Anemones and primroses,
And the blue violets of spring,
We found whilst listening by a hedge
To hear a merry plowman sing.
And from the earth the plow turn'd
up
There came a sweet, refreshing smell,
Such as the lily of the vale
Sends forth from many a woodland
dell.

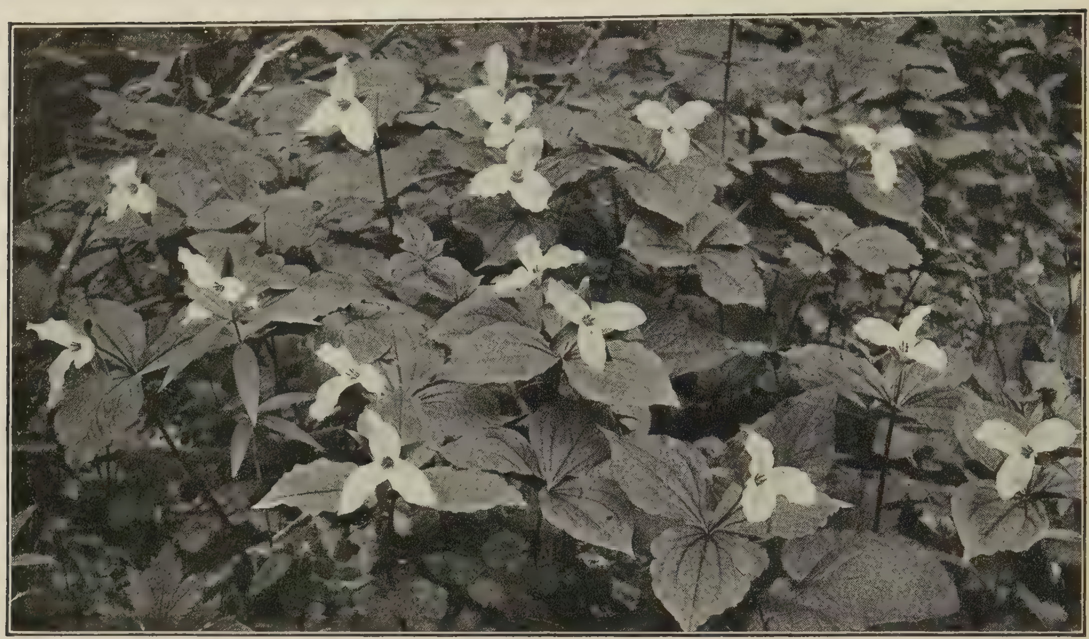
THOMAS MILLER.

MAY! Are you ready for another tramp to the flowered fields with me? We did not gather all the blossoms on that last April trip. Nor can we get them all this time. The truth is I have

CLAYTONIA (*Claytonia caroliniana*)

the list in my pocket. I know right where I am going to take you, and I shall not let any of you run helter-skelter this way and that on your own rollicking feet for fear you find so many that we shall never get back. You see, I really have a dreadful problem to solve on these flower and tree trips, and that problem is how to keep you from seeing too many flowers — too many, I mean, for this book. For this is not a botany, remember. I am none of your old, nearsighted, moss-grown herbalists whom you have seen the cannibals eating (in

BLUETS (*Houstonia cærulea*) AND CINNAMON FERN (*Osmunda cinnamonea*)



LARGE-FLOWERED WAKE-ROBIN (*Trillium grandiflorum*)

the back of the magazines) while said herbalists were examining the whiskers on some desert cactus with a six-inch telescope! In other words I am only taking you out into the fields — until you learn the way — and there I am to leave you. We will take the common flowers — learn to use our eyes, in other words, and after that — the botany, and the "herbalist," cactus whiskers, cannibals, and all.

The Trillium. Do you know John Burroughs's book, "Wake-robin"? Then you know what he says of the trillium or wake-robin for which the book was named. His "wake-robin" is the large, white-flowered species.

"Trilliums derive their generic name from the fact that all their parts are arranged in threes — three leaves, three petals, three sepals, and a three-parted stigma. The common name of wake-robin was probably early given because these flowers appear at an early date. As a matter of fact they do not bloom until weeks after the robins have returned to the Northern states. All the purple trilliums have an unpleasant odor resembling that of putrid meat; as they are largely dependent for fertilization upon certain carrion flies, it is very probable that their peculiar color is for the purpose of an added lure for these insects."[1]

Large-flowered Wake-robin (*Trillium grandiflorum*). Lily Family. "The trilliums rank among the foremost of our native woodland wild flowers, and they possess an individuality that compares favorably with the exclusive traits of the arbutus, the gentians, the lobelias, and the orchids. This beautiful, large, white-flowered species is one of the choicest and best known of its family. It is found during May and June in damp, rich woods, and grows from eight to eighteen inches high. The single, smooth, stout, juicy stalk terminates with a whorl of three large, handsome, broadly egg-shaped, triple-ribbed leaves which taper suddenly at the apex and are narrowed to a stemless base."[2] The large, waxy-white solitary flower is borne on a short stem that springs upright from the center of the leaves.

Painted Trillium or Wake-robin (*Trillium undulatum*). Lily Family. "The beautiful painted trillium is one of the commonest and most striking of its clan. It loves to dwell beside cool, trickling brooklets and in shady dells in rich, damp woods, where it blossoms

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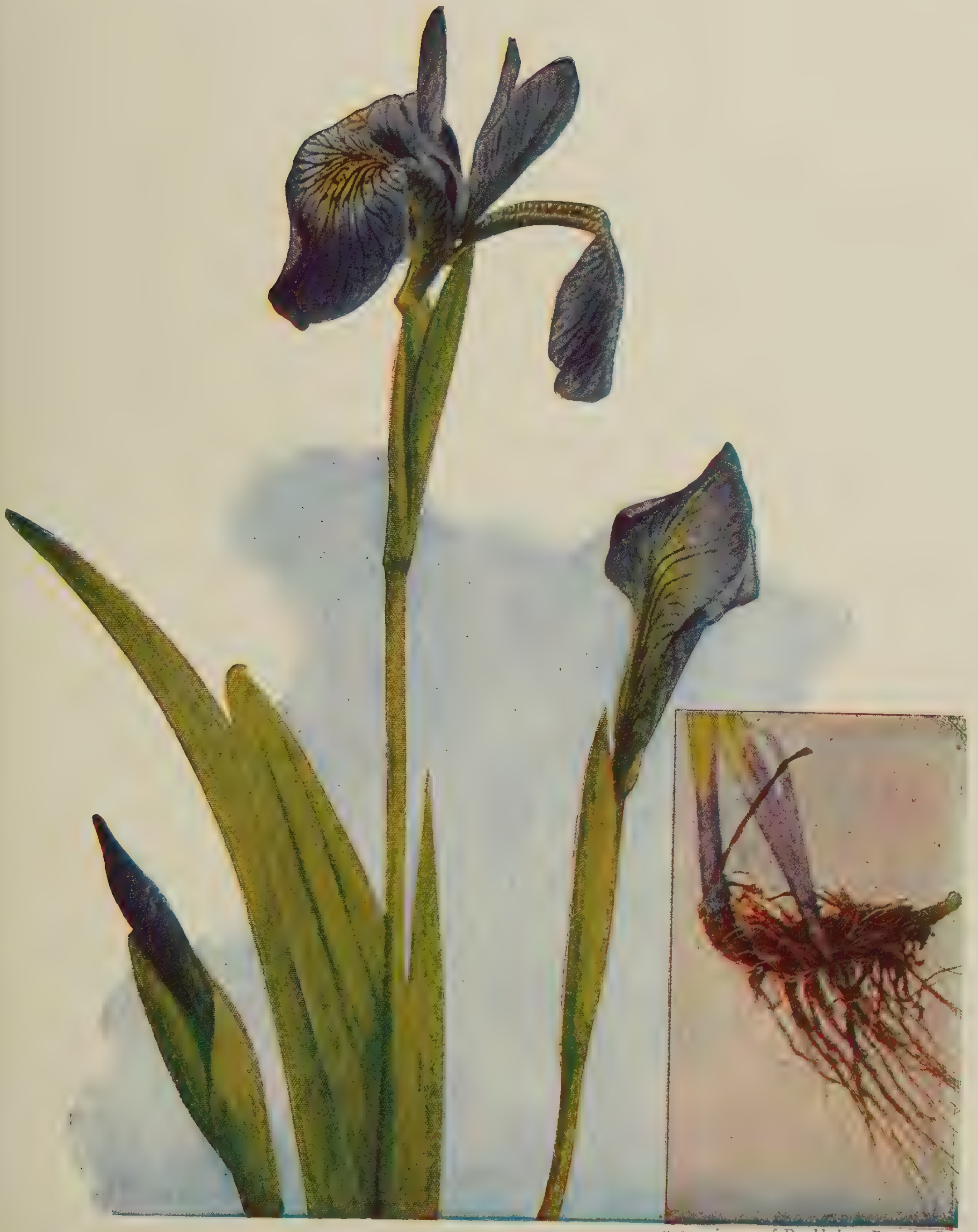
[1] Reed's "Flower Guide."

[2] "Wild Flowers Every Child Should Know."



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LARGER BLUE FLAG, OR FLEUR-DE-LIS

during May and June. The rather slender solitary green stalk is smooth and naked and grows from eight inches to sometimes two feet in height. The large, egg-shaped leaves have a long, tapering point and a rounded base. They have short stems and are triple-veined. The thin, widely spreading, waxy-white, wavy-edged petals are painted with purple stripes at the base. The green sepals are narrow, lance-shaped. The solitary flower is set on a short stem and is often slightly drooped. The egg-shaped fruit is shining bright red when it is ripe."

Purple Trillium, Birthroot, Ill-scented Wake-robin (*Trillium erectum*). Has three purplish-brown petals and three sepals; six stamens exceeding in length the stout, spreading stigma. Flower solitary, rising on a short pedicel above the whorl of broad, ovate, pointed, and short-petioled leaves. This trillium ranges in height from six to fifteen inches. It flowers in April and May, in rich woods from Quebec to Ontario and southward.

WHY BEGIN WITH THE FIRST FLOWERS?

One of the particular benefits of starting into the woods at this time of the year is the training you get in seeing small things. Later on the flood of flowers overwhelms you, but now you have an eye for everything, so that inconspicuous plants that later would be passed unnoticed are eagerly gathered.

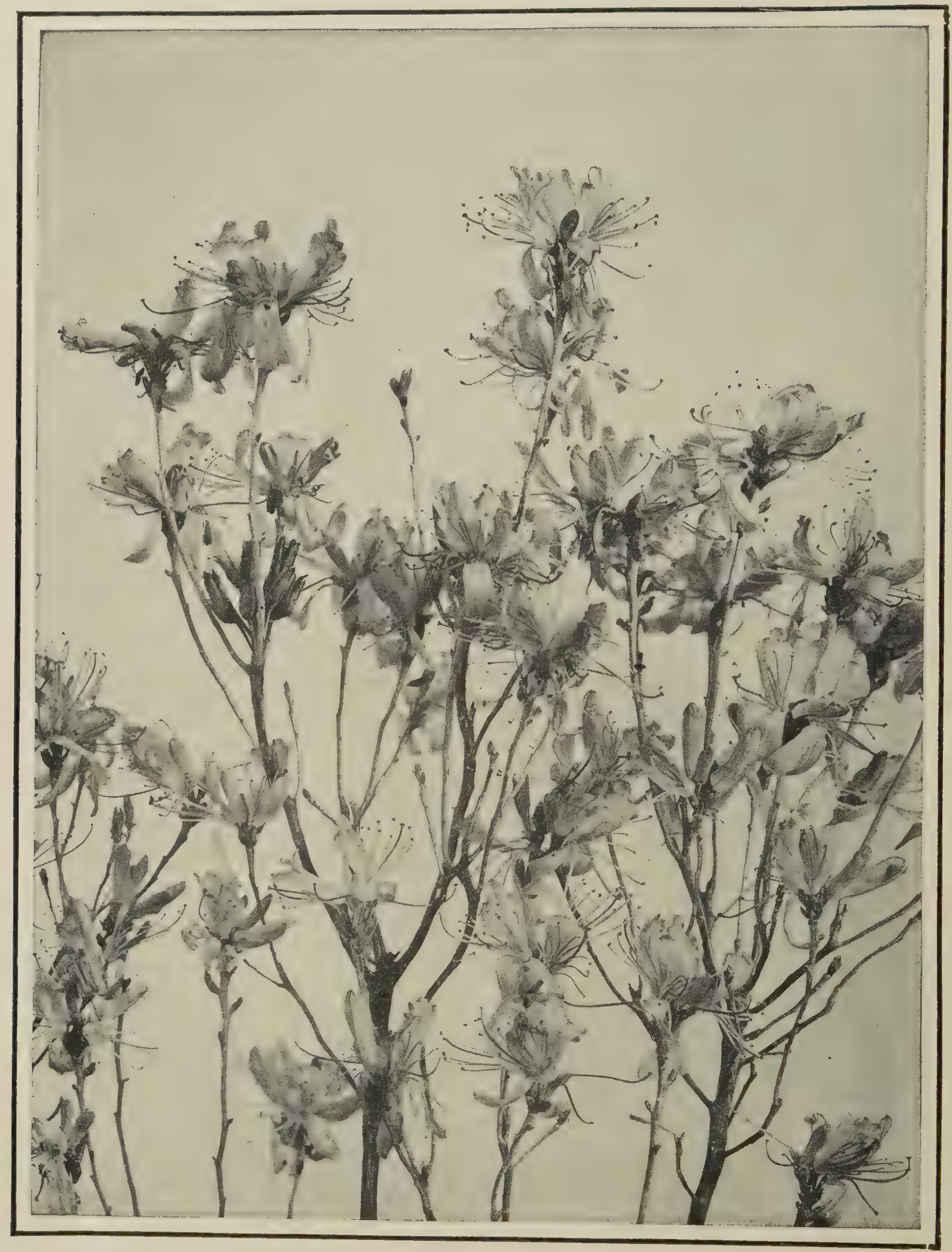
Among these lesser lights are the bellwort or straw bell (*Uvularia perfoliata*), of the lily family. "The inconspicuous, straw-colored, bell-shaped flowers of the graceful bellwort blossom during May and June in rich, moist woods and thickets. The slender, pale-green stalk grows from six to twenty inches high, from a perennial rootstock, and is smooth and round. It is forked above the middle, and usually produces from one to three leaves below the fork. The thin, alternating, pointed oblong leaf entirely surrounds the stalk near the rounded base, and looks as if the stalk grew through it rather than otherwise. This peculiarity is an easy means of identification. They are toned a full green, and are toothless with an entire margin, and have a creased midrib. The rather large, fragrant, solitary, pale-yellow flower hangs, like a pendant, from the ends of the drooping branches."

The Iris. Another that you might overlook in your search for larger things is the sweet little yellow star grass (*Hypoxis hirsuta*), of the iris family. "From May to October our grassy fields and dry, open woods are frequently spangled with the little yellow, starry blossoms of this species. The flower stalks and slender, grasslike leaves rise from a fibrous-rooted, egg-shaped corm. They are more or less hairy, and grow from two to six inches in height."

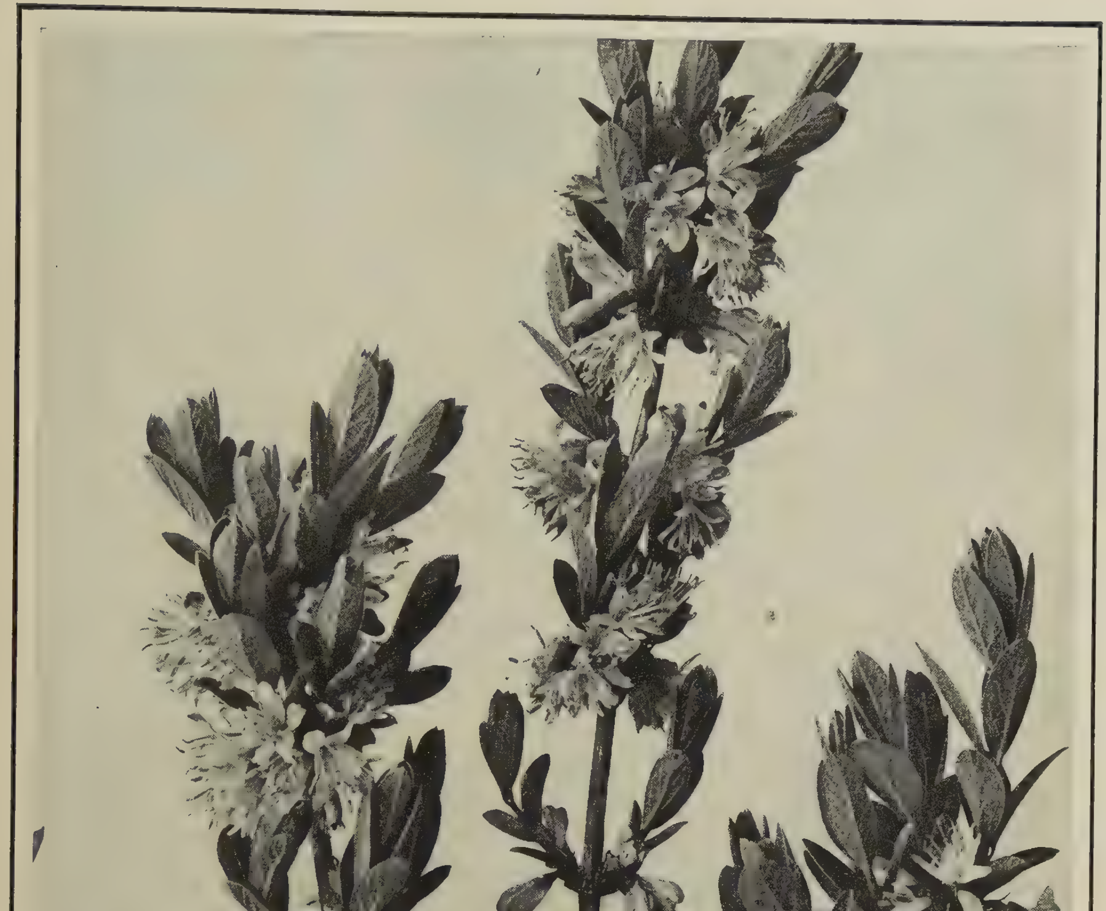
Nor will you miss its little sister, the blue-eyed grass (*Sisyrinchium angustifolium*), of the iris family. "The pretty little blue, starry flowers peep up here and there through the grass of our moist fields and meadows from May to August, like so many golden-centered floral scarf pins. The blossoms expand only *once*, and even then require the bright morning sunshine to coax them fully open, so that their petals curve gracefully backward and expose their bright-yellow eyes. The slender, rigid, two-edged, light-green stalk grows from three to fourteen inches in height. From one to three six-parted, violet-blue, yellow-eyed flowers blossom one at a time, on tiny stems, which spring from a pair of sheathing leaflets at the top of the stalk. This quickly perishing and very dainty little beauty is all the more lovely when we realize that it belongs to the iris family and is related to the showy blue flag."

And with them, belonging to the same large family, blooms the larger blue flag.

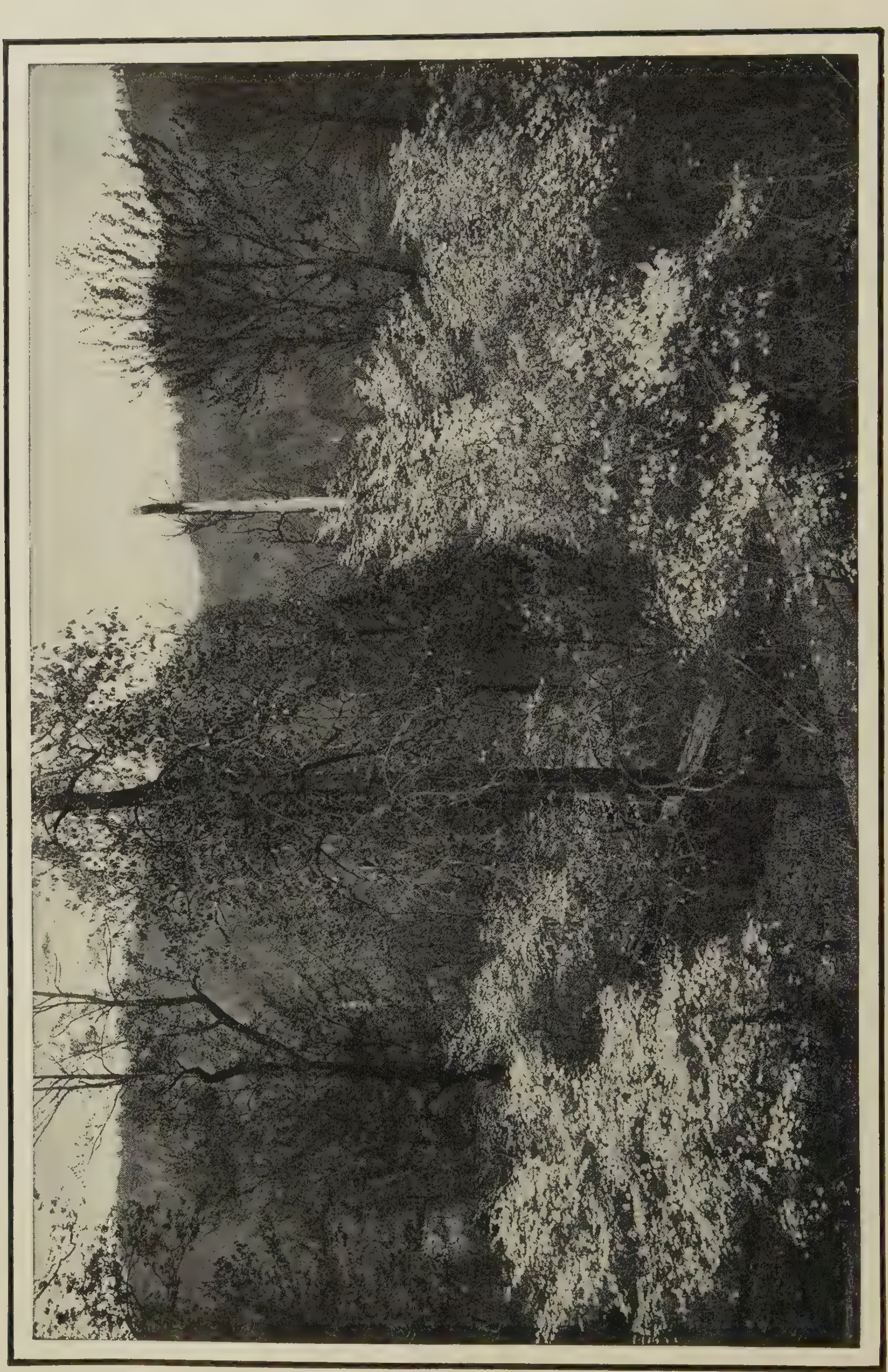
Larger Blue Flag, Blue Iris, or Fleur-de-Lis (*Iris versicolor*). Iris Family. "The fleur-de-lis, which is the flower of chivalry," says Ruskin, "has a sword for its leaf and a lily for its heart." When that young and pious Crusader, Louis VII, adopted it for the emblem of his house, spelling was scarcely an exact science, and the *fleur-de-Louis* soon became corrupted into its present form. Doubtless the royal flower was the white iris, and, as *li* is the Celtic for "white," there is room for another theory as to the origin of the name. It is our far more regal-looking but truly democratic blossom, jostling its fellows in the marshes, that is indeed "born in the purple."



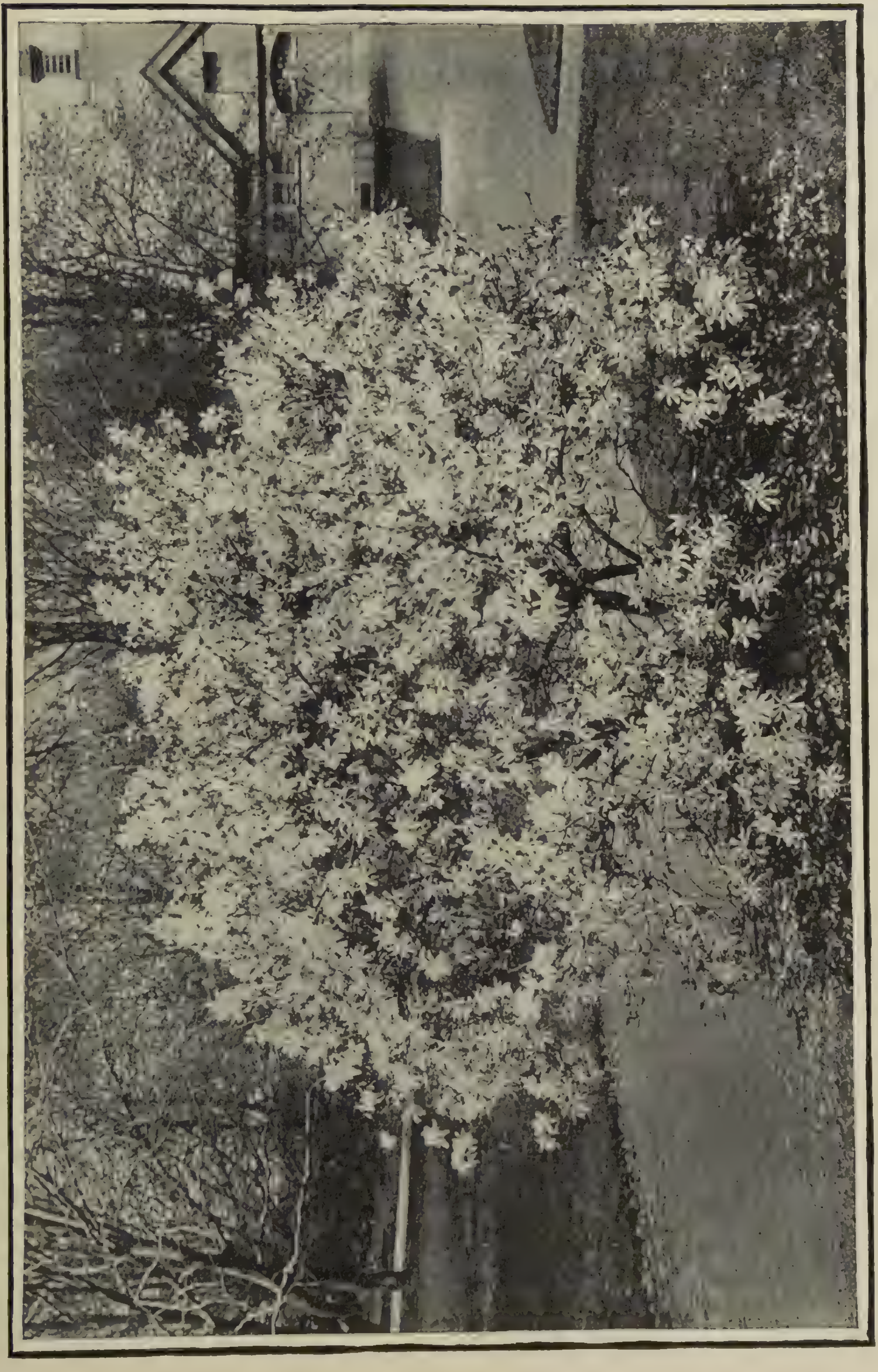
RHODORA (*Rhododendron canadense*)



MOUNTAIN FLY HONEYSUCKLE (*Lonicera cærulea*)



FLOWERING DOGWOOD (*Cornus florida*)



CULTIVATED MAGNOLIA (*Magnolia stellata*)

APPLE TREES, GLORIOUS WITH PINK AND WHITE BLOOMS

When Napoleon wished to pose as the true successor of those ancient French kings whose territory included the half of Europe — ignoring every Louis who ever sat on the throne, for their very name and emblem had become odious to the people — he discarded the *fleur-de-lis*, to replace it with golden bees, the symbol in armory for industry and perseverance.

You will find it along the streams — in them — and in the low, wet meadows clear up to August.

MORE OF MAY'S FLOWERS

But to come back again to the lesser folk. Along in the woods, on the drier knolls and especially about the foot of old pine trees, you will find patches of a little lily-of-the-valley-like flower that is called

Solomon's Seal — Two-leaved Solomon's Seal, or False Lily-of-the-valley (*Unifolium canadense*). A very common flower in moist woods and thickets north and west. "It is a curious little plant, sometimes with only a solitary, long-petioled leaf, but where many of these sterile plants grow together, forming shining beds. Other individuals lift a white-flowered raceme six inches above the ground; and on the slender, often zigzagged flowering stem there may be one to three, usually but two, ovate leaves, pointed at the apex, heart-shaped at the base, either seated on it, one above the other, or standing out from it on distinct but short petioles. This flower has only four segments and four stamens. Like the wild spikenard, the little plant bears clusters of pale, red-speckled berries in autumn."

The Hairy, or True, or Twin-flowered Solomon's Seal (*Polygonatum biflorum*). Lily-of-the-valley Family. From a many-jointed, thick rootstock a single gracefully curved stem grows each spring; withers after fruiting, and leaves a round scar, whose outlines suggested to the fanciful man who named the genus the seal of King Solomon. Thus one may know the age of a root by its seals, as one tells that of a tree by the rings in its trunk.

The dingy little cylindric flowers, hidden beneath the leaves, may be either self-pollenized or cross-pollenized by the bumblebees to which they are adapted. "We may suppose," says Professor Robertson, "that the pendulous position of the flowers owes its origin to the fact that it renders them less convenient to other insects, but equally convenient to the higher bees which are the most efficient pollinators; and that the resulting protection to pollen and nectar is merely an incidental effect." Certain Lepidoptera, and small insects which crawl into the cylinder, visit all the Solomon's seals.

Not the most beautiful but the most curious of all of May's flowers is the pitcher plant.

Pitcher Plant, Huntsman's Cup, or Indian Cup. Pitcher-plant Family. "In many respects the pitcher plant is one of the most interesting and curiosity-exciting of our wild flowers. Perhaps you have heard that some plants 'eat' insects, and here you are face to face with one of them. First of all, let us substitute the word 'absorb' for the word 'eat,' and we shall better understand our subject, which neither chews nor swallows. Farmers and gardeners, we know, replenish the soil with fertilizer containing a large portion of animal matter, such as ground bone and fish, which supplies nitrogen, a necessary element for leaf and stalk formation, and which is absorbed through the activity of plant roots. The leaves of the pitcher plant have developed some of the power of the roots by absorbing the nitrogenous matter from decomposing insects, which they ingeniously attract and capture for this purpose. Broadly speaking, that is all there is to it, and the construction of the leaves and their method of entrapping the insects is more interesting to learn. The leaves are elongate and tubular, tapering from the root and bulging widely toward the center, forming a sort of pitcher-shaped growth, with the blunt, open end flared to one side into a short, pointed, and flapped hood. They curve gracefully outward and upward, and the inner or concaved side, which faces the flower stalk, has a very broad wing or keel. They are yellowish-green in color, conspicuously lined and veined with purple, and grow from four to twelve inches long. The texture is stout and leathery, and the outer and inner surfaces are smooth. The pitchers are generally half-filled with water, and the inner surface of the hood is thickly covered with fine, hairy bristles which point downward toward the opening. Just inside the aperture is secreted a sweet, sticky substance, which is

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A COUNTRY LANE

supposed to attract insects to it. Once inside the pitcher, the insect becomes a captive, and in trying to escape it encounters the labyrinth of reflexed hairs, falls exhausted into the water, and is finally drowned."[1]

Wild Honeysuckle, Pinxter Flower, Pink, Purple, or Wild Azalea (*Rhododendron nudiflorum*). Heath Family. This is one of the real glories of May, giving a touch of the gorgeous summer to the woods.

"The lively flower clusters of the beautiful wild honeysuckle reflect the glory of spring with a vividness that is well-nigh unrivaled. The brilliancy of its fringy blossoms illuminates our open woodlands, hillsides, and swamps from April to June, and, as the flowers usually burst into bloom before their foliage expands, they are particularly conspicuous and winsome. At this time, they also possess a peculiar attraction for small boys, who eagerly seek a singular edible pulpy growth, known to them as the May apple, which is found hanging among the fragrant flowers. Years ago this juicy, pale-green morsel was supposed to have been caused by insects, but it is now believed to be a modified bud."

Although it is not exactly a May flower, it still will be well to stop and pluck a handful of the long buds (for it will open before the first of June) of the white azalea, because it is sister to the pink one just gathered.

The Swamp Honeysuckle, White Azalea (*Rhododendron viscosum*). This is a most beautiful swamp shrub, with handsome, fragrant, white flowers. In low, wet swamps it is very common and blooms profusely during June and July. The bush is from three to eight feet in height and very branchy. The leaves are long-oval, broadest toward the blunt-pointed tip and narrowing to short stems.

"The beautiful flowers are pure white, or rarely tinged with pink; the tube of the long corolla is covered with very sticky, brownish hairs, and terminates in five large, pointed, spreading lobes. The stamens are very long, slender, and white, and tipped with yellow anthers. The five-pointed calyx is very small and inconspicuous.

"During the early time of their bloom, all the azaleas bear, hanging among the fragrant flowers, peculiar, juicy, pulpy growths that are edible, as any well-bred farmer's boy knows; he calls them May or swamp apples, but they are really modified buds and not fungous growths or caused by insects, as was formerly believed. These beautiful azaleas are found from Maine to Ohio and southward."[2]

And so too, though we may need to wander far to find it, we will gather a spray of sweet rhodora.

> Rhodora! if the sages ask thee why
> Thy charm is wasted on the earth and sky,
> Tell them, dear, that if eyes were made for seeing
> Then beauty is its own excuse for being.
>
> EMERSON.

Rhodora (*Rhododendron canadense*). This beautiful member of the family is a smaller shrub, growing from one to three feet high. The flowers usually appear before the pale-green, oblong leaves; the corolla is about one inch long, light magenta, and two-lipped. The upper lip is three-lobed, and the lower is nearly divided into two distinct, linear petals. They grow in thin clusters terminating the branches. Rhodora is found on damp hillsides and in swamps from Newfoundland to Quebec and south to New Jersey and Pennsylvania, flowering during May and June.

What shall I do? Where shall I stop? Here is the apple orchard glorious with pink and white blooms, worlds of it, worlds of it, drifting to the green grass in snowy showers, floating away into the vault of the blue sky on the songs of birds — wide winds of fragrance filling the world!

What shall I do? And where shall I stop and turn back to the house? Have I seen or can I see anything more wonderful than the orchard? But we are going to keep to the *wild* flowers, to the wild *flowers* I should say, though I cannot help but put one *tree* in here — the glorious flowering dogwood. It will tell its own story; no mere words can add to its great loveliness. May could not be May without the flowering dogwood. (See illustration, page 352.)

I will turn back soon. There are just a few more of the children of May that you must know, and among them the

Shooting Star, American Cowslip. Primrose

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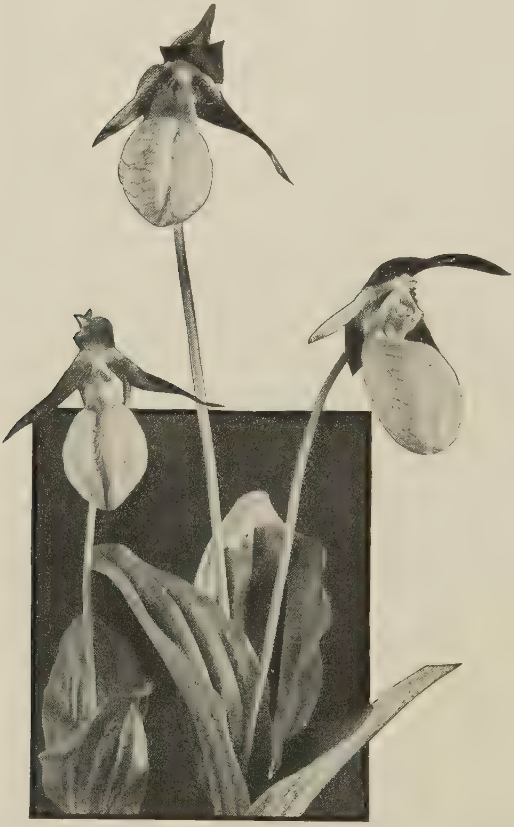
[1] "Wild Flowers Every Child Should Know."

[2] Reed's "Flower Guide."

SWAMP SHRUBS AND GRASSES, IRIS IN THE FOREGROUND

Family. "The pert, nodding flowers of this handsome perennial decorate the moist cliffs and ridges in open woodlands, and also the prairies, during April and May, from Pennsylvania to Georgia, and west to Manitoba and Texas. The flowering stalk rises one or two feet high from a basal cluster of pointed oblong leaves, which taper into narrow, winged stems. The rootstock is stout and fibrous. Several showy, purplish pink or white flowers are gathered into a loose terminal arrangement. These hang from slender, curving stems which spring from the tip of the stalk."



PINK LADY'S SLIPPER (*Cypripedium acaule*)

One of the few common orchids.

May Apple, Mandrake, Wild Lemon, or Hog Apple. Barberry Family. This is another of them. If you have never seen a colony of them, moving like a crowd of parasols under the open trees of the woods, you have missed one of May's rarest sights.

"The May apple does not await the passing of April showers before preparing to attend May's annual floral festival. But with an air of seeming indifference and independence, as though borne of impatience, it boldly defies the rain with its handsome leaves arranged like a closed umbrella around its slender stalk and which gradually expand as they clear the ground. Excepting their bronze-green color, when they have just emerged from the earth, they have much the same appearance as a bit of oily rag after having been forced through a rifle barrel on the end of a cleaning rod. They are popularly known as 'umbrella plants' by children who roam the woods in early spring, and they surely deserve this name."[1]

We are getting leg-weary on this tramp, and must be turning back; but may I not gather two or three more? For see the woods — full of them, and such flowers! Why, here is the queen of them all — the pink lady's slipper! I shall not touch one of them for the simple reason that I have no need to pick them. I can see them blooming outside of my study window on the slope of the hill.

Pink Lady's Slipper, Moccasin Flower. It has solitary flowers surmounting a scape from eight to twelve inches high; lip large, drooping, pink, with a slit in front, instead of a circular opening as in the others. It frequents dry woods and may be found from southern Canada southward.

"Although this is the most common of the lady's slippers, it is no less beautiful than the others. The flower of the present species is a very ingenious contrivance; it is fertilized by the common bumblebee. The only entrance is through the fissure in the front; it requires considerable pressure to force his burly frame through, but at length he succeeds and the aperture closes behind him. After eating his fill he takes the easiest way out, toward the base, where he can see two spots of light. As he forces his way through the narrow passage he comes in contact with a sticky stigma, armed with incurving hairs which remove any pollen he may have on his back; as he continues his struggle out he reaches an anther blocking the passage and waiting to clap its load of pollen on his back."[1]

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[1] "Wild Flowers Every Child Should Know."

Wild Columbine. And I may stop, may I not, for a bunch of columbine, hanging down with a feathery Christmas fern from the cleft in the woods rocks?

"The wild columbine loves to frequent the sunny, rocky slopes and ledges in open woods where the soil is sparse and well drained. It often prospers with barely sufficient earth to cover its roots, and causes one to wonder how it manages to keep from perishing altogether during the extended dry spells of summer and fall. The flowers are scarlet, with yellow linings. They are conspicuously large and showy, and hang, nodding, upside down, from fine, thread-like stems. They vary greatly, measuring from one to two inches long, and are rather bulky. The five petals are narrow and cone-shaped, and taper sharply to a thickened, rounded point."

WILD COLUMBINE (*Aquilegia canadensis*)

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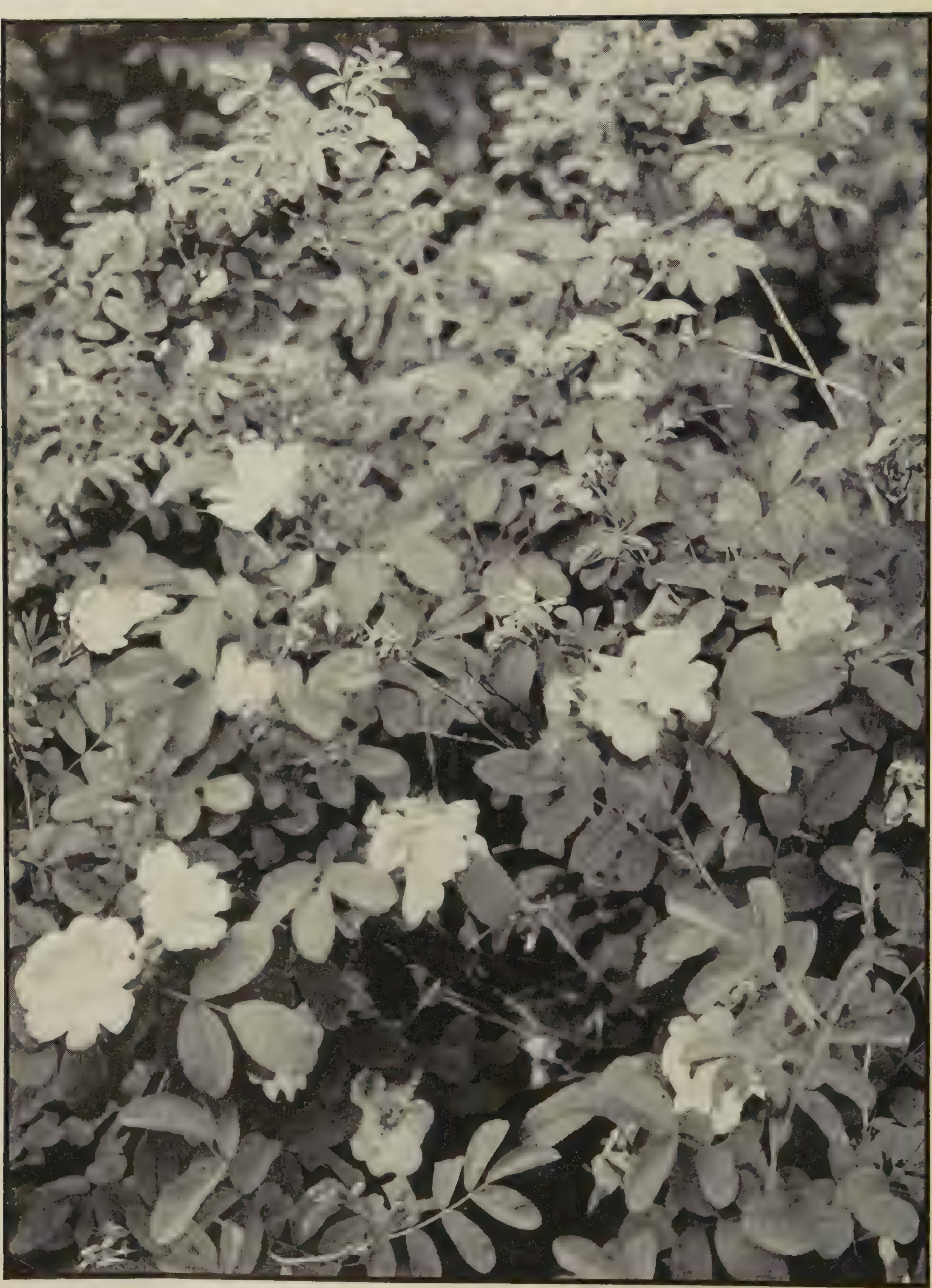
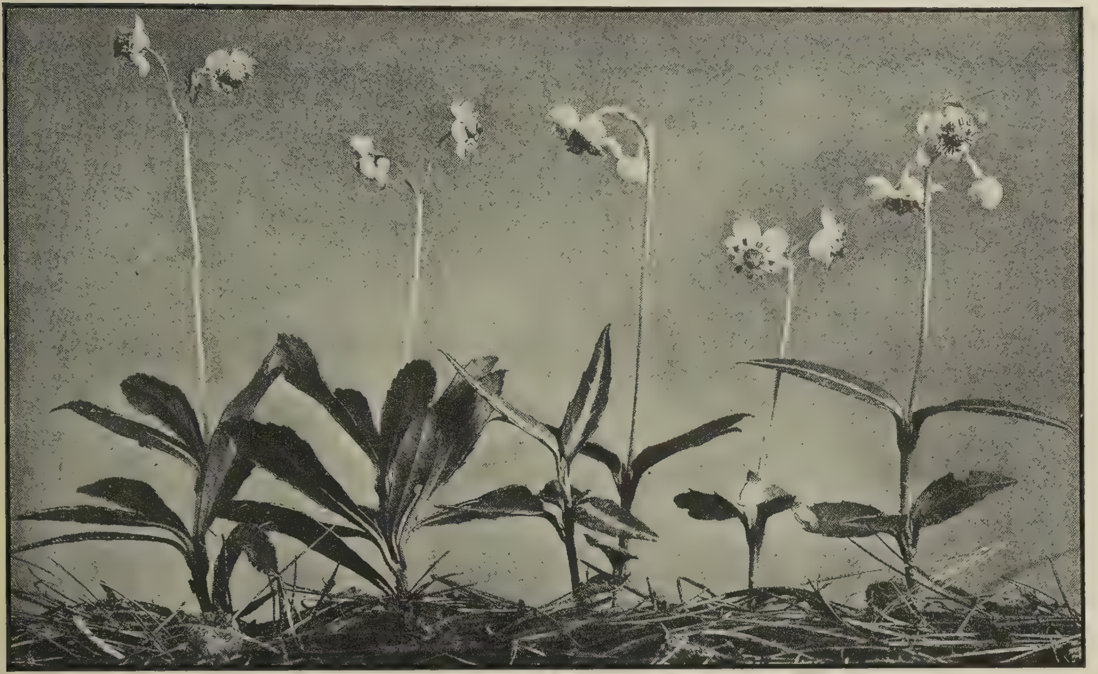
[1] Reed's "Flower Guide."



Courtesy of Field Museum of Natural History, Chicago

THE SMOOTH, EARLY OR MEADOW ROSE (*Rosa blanda*)



PIPSISSEWA (*Chimaphila umbellata*) — PRINCE'S PINE, AT LEFT. AT RIGHT, *Chimaphila maculata*, SPOTTED WINTERGREEN

IN JUNE

I know a bank whereon the wild thyme blows,
Where oxlips and the nodding violet grow:
Quite over canopied with lush woodbine,
With sweet musk roses and with eglantine.
SHAKESPEARE.

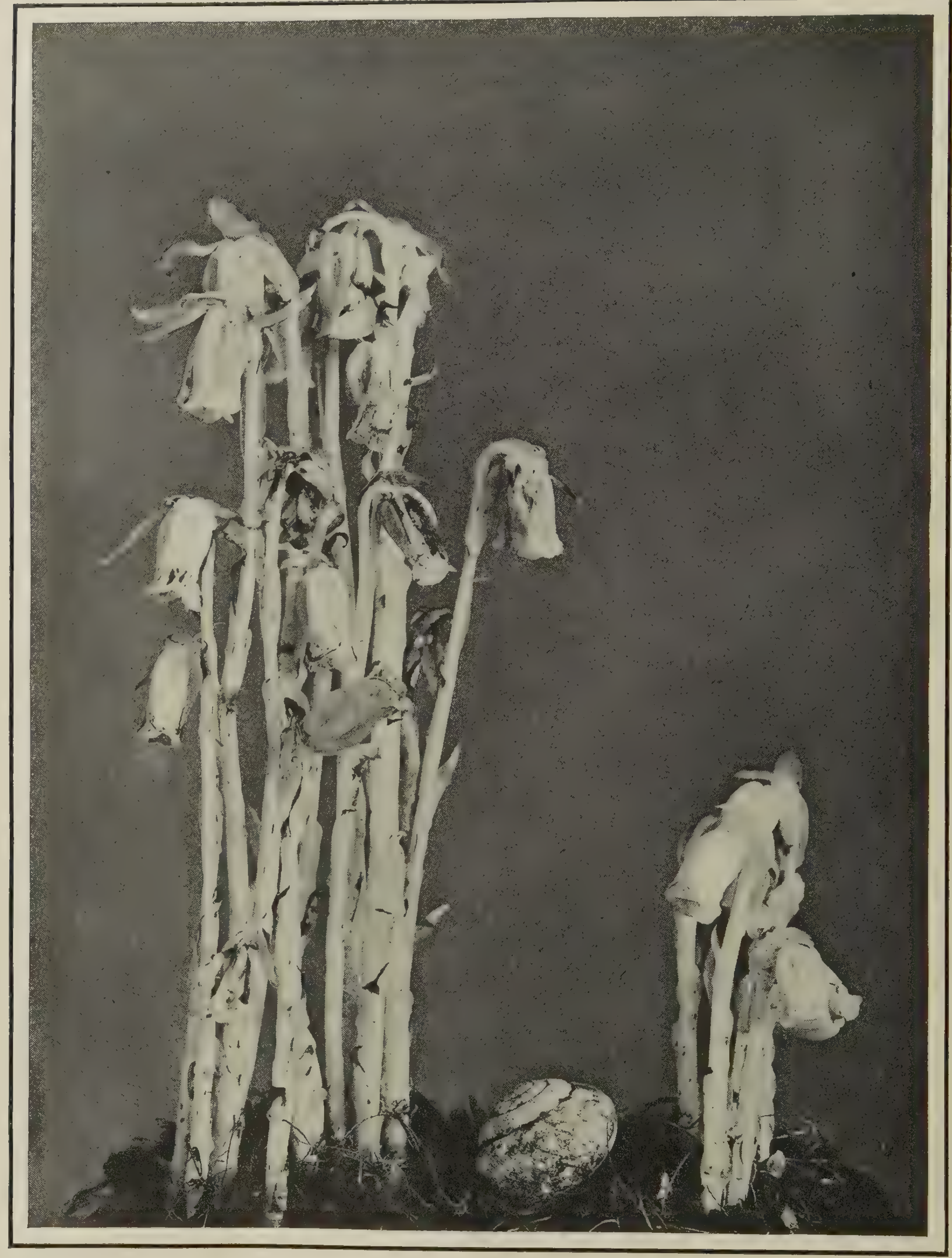
AND so do you, and banks and dells where a hundred other lovely things open their faces to the sky and greet us with their sweet perfume on perfect days like June's.

The trouble—the only trouble—on a tramp for flowers in June is the choice of place and the limited time, for long as the days are they are too short for all the flowers that we should like to stop with and visit as we pass along.

If the day is bright we take the wood path where the prince's pine or pipsissewa is in bloom, and where along with it we find its still more beautiful cousin, the spotted wintergreen (*Chimaphila maculata*), which closely resembles the prince's pine, except that its slightly larger white or pinkish flowers lack the deep-pink ring; and the lance-shaped leaves, with rather distant saw teeth, are beautifully mottled with white along the veins. When we see short-lipped bees and flies about these flowers, we may be sure their pollen-covered mouths come in contact with the moist stigma on the summit of the little top-shaped style, and so effect cross-fertilization.

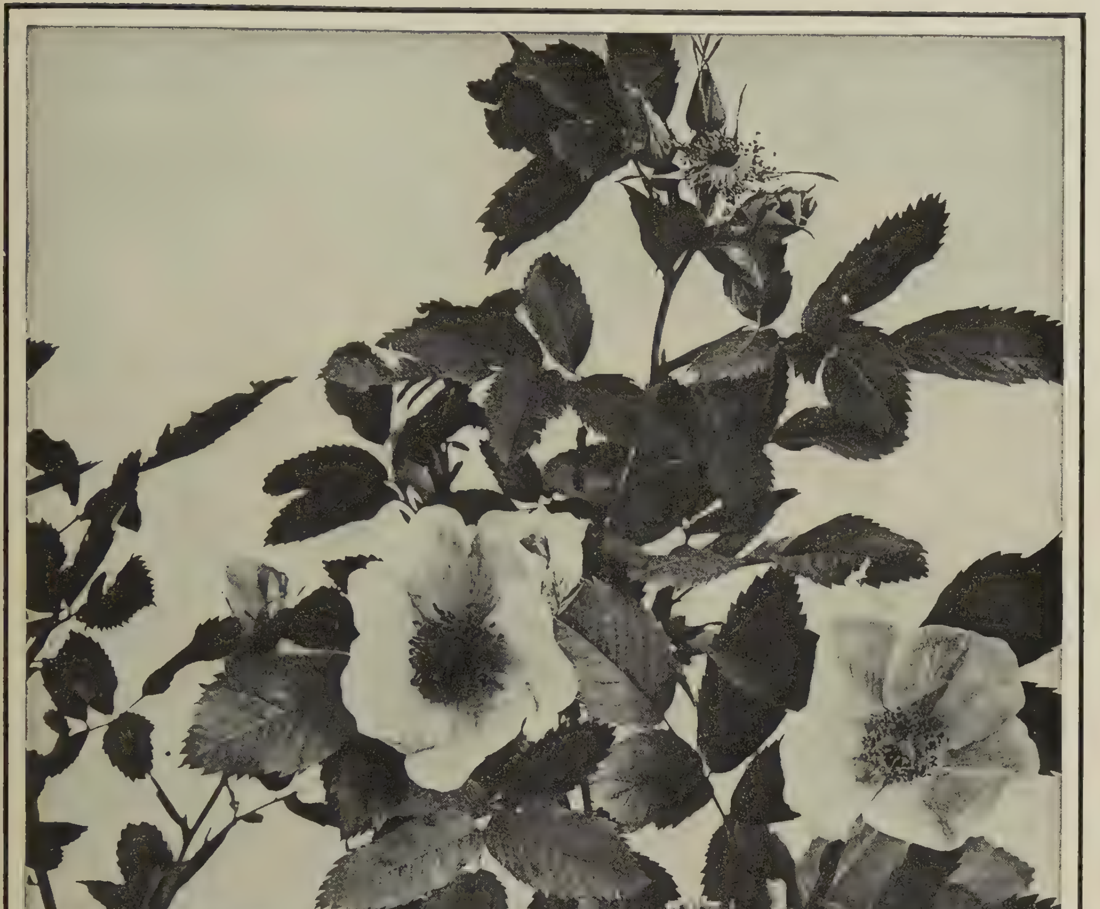
Both of these are of the wintergreen family, and lovers of winter they are indeed, the beautiful leaves of the prince's pine keeping their color and gloss in spite of snow and intense cold. "A few yards of the trailing stem, easily ripped from the light soil of its woodland home, make a charming indoor decoration, especially when the little brown seed cases remain. Few flowers are more suggestive of the woods than these shy, dainty, deliciously fragrant little blossoms."

All in bud, but not yet open, growing in the same soil of the open woods is the sweet checkerberry, or wintergreen, that flavors our candy, and adds by its sweet, spicy berries so much of flavor to our winter walks in the woods. This belongs to the heath family, along with prince's pine, shinleaf, pinesap, and Indian pipe, all of which are found growing together in the open



INDIAN PIPE (*Monotropa uniflora*)

Often called the ghost flower, on account of its startling white appearance in the dark woods. This plant lives on food prepared by other plants, and may be regarded as a thief among the flower family.



SWAMP ROSE (*Rosa carolina*)

June woods. The pinesap and Indian pipe are parasites, getting their life from the roots of other plants.

Strange, odd, ghostly forms are these latter flowers.

"Colorless in every part, waxy, cold, and clammy, Indian pipes rise like a company of wraiths in the dim forest that suits them well. Ghoulish parasites, uncanny saprophytes, for their matted roots prey either on the juices of living plants or on the decaying matter of dead ones, how weirdly beautiful and decorative they are! The strange plant grows also in Japan, and one can readily imagine how fascinated the native artists must be by its chaste charms.

"Yet to one who can read the faces of flowers, as it were, it stands a branded sinner. Doubtless its ancestors were industrious, honest creatures, seeking their food in the soil, and digesting it with the help of leaves filled with good green matter (chlorophyll) on which virtuous vegetable life depends; but some ancestral knave elected to live by piracy, to drain the already digested food of its neighbors; so the Indian pipe gradually lost the use of parts for which it had need no longer, until we find it to-day without color and its leaves degenerated into mere scaly bracts. Nature has manifold ways of illustrating the parable of the ten pieces of money. Spiritual law is natural law: 'From him that hath not, even that he hath shall be taken away.' Among plants, as among souls, there are all degrees of backsliders. The foxglove, which is guilty of only sly, petty larceny, wears not the equivalent of the striped suit and the shaved head; nor does the mistletoe, which steals crude food from the tree, but still digests it itself, and is therefore only a dingy yellowish-green. Such plants, however, as the broom-rape, pinesap, beechdrops, the Indian pipe, and the dodder — which marks the lowest stage of degradation of them all — appear among their race branded with the mark of crime as surely as was Cain."[1]

What a world of freshness and color and odor greets us in the meadows — loosestrifes, with their slender wands of yellow blossoms!

The Four-leaved or Whorled Loosestrife or Crosswort. Primrose Family. "Fairies' Fountain would have been a more deserving and appropriate name for this pretty floral cascade. During a shower this allusion becomes more real than fancied, as the attractive leaves are arranged in whorls or wheels, one above the other, at regular intervals along the slender, upright stalk, just like basins in a fountain, that catch the drip from tip to base. The trembling yellow flowers, which spring gracefully from the center of the green, leafy basins, are sprayed in every direction, and when the plant sways in the sunshine, they glitter and sparkle as they play over the curving leafy rims—brilliant paint cups, where 'here and there the fresh green meadows show a touch of as vivid a red as that in which Vibert delighted to dip his brush.'"[2]

The Painted Cup.

"Scarlet tufts
Are glowing in the green like flakes of fire;
The wanderers of the prairie know them well,
And call that brilliant flower the 'painted cup.'"

"Thoreau, who objected to this name, thought flame flower a better one, the name the Indians gave to Oswego tea; but here the floral bracts, not the flowers themselves, are on fire. Lacking good, honest, deep green, one suspects from the yellowish tone of calices, stem, and leaves that this plant is something of a thief. That it still possesses foliage, proves only petty larceny against it, similar to the foxglove. Under cover of darkness, in the soil below, the roots of our painted cup occasionally break in and steal from the roots of its neighbors such juices as the plant must work over into vegetable tissue. Therefore it still needs leaves, indispensable parts of a digestive apparatus. Were it wholly given up to piracy, like the dodder, or as parasitic as the Indian pipe, even the green and the leaf that it hath would be taken away from this slothful servant."[1]

The Roses — the sweet wild roses — how the whole sweet summer comes flooding the green, gay world with glory! Do you know the wild rose — roses, I should say?

"In literature, ancient and modern, sacred and profane, no flower figures so conspicuously as the rose. To the Romans it was most significant when placed over the door of a public or private banquet hall. Each who passed beneath it bound himself thereby not to disclose any-

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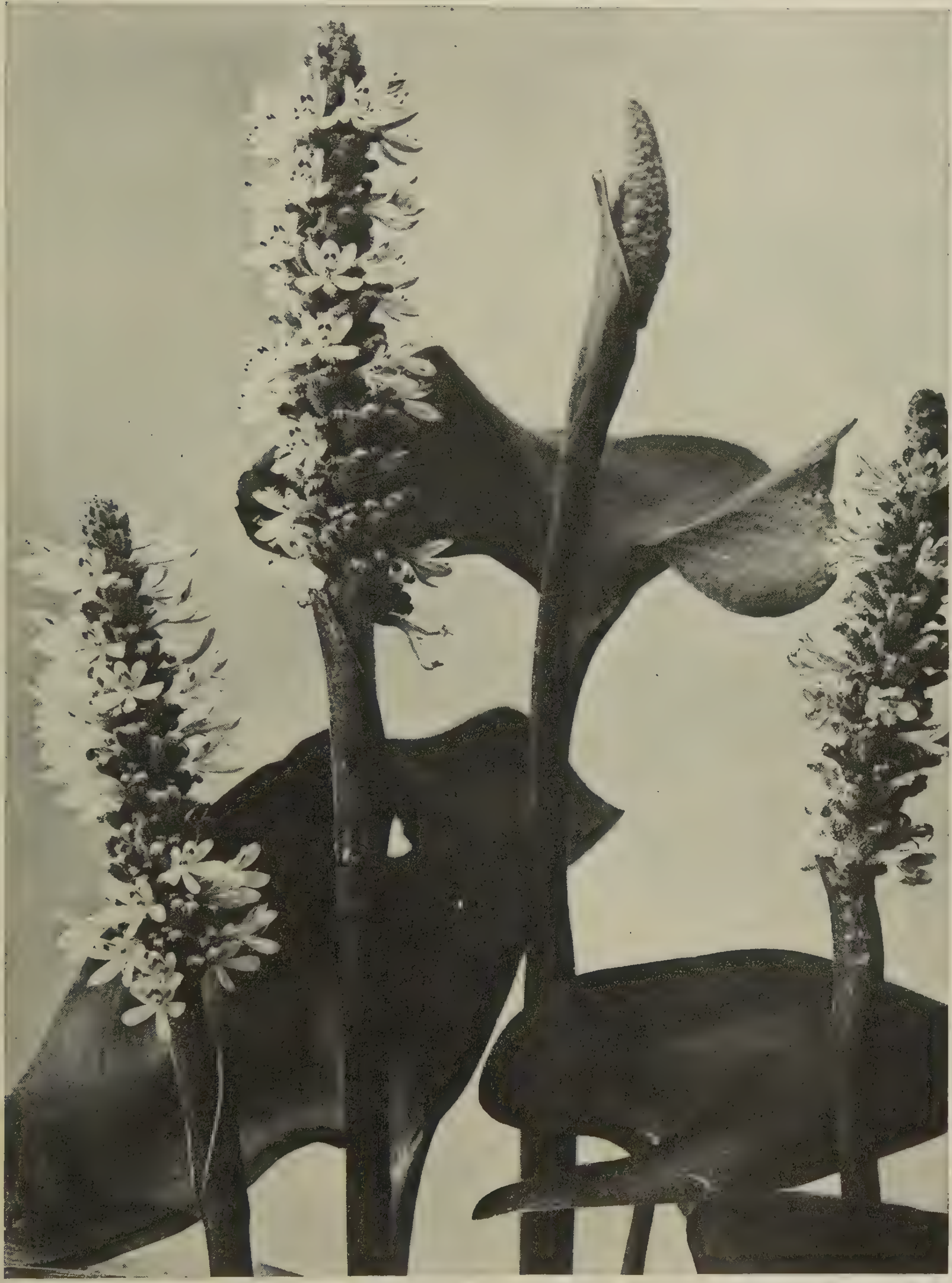
[1] "Nature's Garden."

[2] "Wild Flowers Every Child Should Know."



PICKEREL WEED (*Pontederia cordata*)

The blue spikes of this flower line our rivers.

thing said or done within; hence the expression *sub rosa*, common to this day."[1]

No description of our common, low, dwarf, or pasture rose (*Rosa humilis*) — *Rosa licida* of Gray — is needed. One's acquaintance with flowers must be limited indeed, if it does not include this most common of all our pink roses.

WATER LILIES

The prairie, climbing, or Michigan rose (*Rosa setigera*) has clusters of deep, bright pink flowers, that after a while fade almost white, above the thickets and rich prairie soil, from southern Ontario and Wisconsin to the Gulf, as far eastward as Florida. Its flowers have no odor, but it has the distinction of being our only native rose that has ever passed into cultivation.

The smooth, early, or meadow rose (*Rosa blanda*), found blooming in June and July in moist, rocky places from Newfoundland to New Jersey and a thousand miles westward, has a trifle larger and slightly fragrant flower, at first pink, later pure white. This is a leafy, low bush, mostly less than three feet high; it is either entirely unarmed, or else provided with only a few weak prickles.

In spite of its American Indian name, the lovely white Cherokee rose (*Rosa sinica*), that runs wild in the South, climbing, rambling, and rioting with a truly Oriental abandon and luxuriance, did in reality come from China.

ON TO THE POND

We cannot stop longer in the pastures and meadows, but must away to the ponds for the marsh calla.

Water Arum, Marsh Calla. Arum Family. At a glance one knows this beautiful denizen of Northern bogs and ditches to be a poor relation of the stately Ethiopian calla lily of our greenhouses. Where the arum grows in rich, cool retreats, it is apt to be abundant, its slender rootstocks running hither and thither through the yielding soil with thrifty rapidity until the place is carpeted with its handsome dark leaves, from which the pure white flowers arise; and yet many flower lovers well up in field practice know it not. Thoreau, for example, was no longer young when he first saw or rather noticed it. "Having found this in one place," he wrote, "I now find it in another. Many an object is not seen, though it falls within the range of our visual ray, because it does not come within the range of our intellectual ray. So, in the largest sense, we find only the world we look for."

Here is the golden club, another of the arum family just passing, as it is one of the first to open in the pond. Like the water arum, it is the only member of its genus. It is odd in having no protective spathe for the golden floral club.

The florets are complete, having six sepals and stamens; they are set closely on the swollen spadix and attract many flies, and even water snails, that cross-fertilize them by simply crawling over the clubs.

The leaves of the golden club are pointed oblong in shape, floating on the surface of the water by means of long stems from the perennial rootstock. It flowers in May from Massachusetts to Florida and westward. It is first cousin to the Jack-in-the-pulpit.

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[1] "Nature's Garden."

We cannot miss the spatter-docks with their golden door knobs, that we children called "watches."

Cow Lily, Yellow Pond Lily. "Is not unattractive and is interesting in its make-up. The leaves are thick, rough, ovate, slit or lobed to the stem, which is long and hollow. The flower is raised above the surface of the water on a long, hollow stem. What appear to be six large, green and yellow petals are in reality sepals; the real petals are numerous, stamen-like, inserted with the very numerous stamens under the golden-yellow rayed disk that forms the stigma. Very common in still or stagnant water."[1]

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"WHERE THE SHADOWS LIE AND THE BROOK BUBBLES OVER THE TANGLED ROOTS"

And along with it in *one* of the ponds near my home here opens the sweet white water lily, which you will find in rivers and ponds throughout the Eastern states.

Water Lily, Water Nymph (*Nymphæa odorata*). This flower needs no introduction. "To my mind, it leads all others in beauty, grace, purity, and fragrance. It is composed of four sepals, greenish on the outside and whitish within, and numerous pure, waxy-white petals. They sometimes are gigantic in size, often spreading five or six inches across. It flowers from June to September in ponds or slow-moving water."

Monkey Flower. Figwort Family. Along the margins and beside the brook even in the woods we find this jolly little monkey flower.

"No wader is the square-stemmed monkey flower, whose blue grinning corolla peers at one from grassy tuffets in swamps, from the brookside, the springy soil of low meadows, and damp hollows beside the road; but moisture it must have to fill its nectary and to soften the ground for the easier transit of its creeping rootstock. Imaginative eyes see what appears to them the gaping face of a little ape or buffoon in this common flower whose drolleries, such as they are, call forth the only applause desired — the buzz of insects that become pollen-laden during the entertainment."[2]

And there is another blue beauty with a queer flower that might be mistaken for the monkey flower.

The Larger or Hyssop Skullcap. "It rarely has a dent in its rounded-oblong leaves, which, like the stem, are covered with fine down. Its lovely, bright-blue flowers, an inch long, the lips of about equal length, are grouped opposite each other at the top of a stem that never lifts them higher than two feet; and so their beauty is often concealed in the tall grass of roadsides and meadows and the undergrowth of woods and thickets, where they bloom from May to August, from southern New England to the Gulf of Mexico, westward to Texas."[1]

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[1] Reed's "Flower Guide."

[2] "Nature's Garden."

Viper's Bugloss. Because it grows in *dry* fields and waste places you need not confuse this flower with either of the two blue flowers above. It has a hairy, bristly stem and is generally wild and hairy all over. It is an "escaped" plant from Europe.

The Blue Pickerel Weed. But I cannot leave the pond without pulling a spike of the pickerel weed.

"Grace of habit and the bright beauty of its long, blue spikes of ragged flowers above rich, glossy leaves give a charm to this vigorous wader. Backwoodsmen will tell you that pickerels lay their eggs among the leaves; but so they do among the sedges, arums, wild rice, and various aquatic plants, like many another fish. Bees and flies, that congregate about the blossoms to feed, may sometimes fly too low, and so give a plausible reason for the pickerel's choice of haunt.

"Each blossom of this plant lasts but a single day; the upper portion, withering, leaves the base of the perianth to harden about the ovary and protect the solitary seed. But as the gradually lengthened spike keeps up an uninterrupted succession of bloom for months, more than ample provision is made for the perpetuation of the race — a necessity to any plant that refuses to thrive unless it stands in water. Ponds and streams have an unpleasant habit of drying up in summer, and often the pickerel weed looks as brown as a bulrush where it is stranded in the baked mud in August. When seed falls on such ground, if indeed it germinates at all, the young plant naturally withers away."[1]

We have had a dip into June — a mere glimpse of her glory. Let us shut our eyes, turn about, and start home — opening our eyes, however, for the hillside yonder, covered as with pink and ivory snow by the mountain laurel. Here in Massachusetts it grows more sparingly, but about the low, sandy country of my boyhood home it fairly drifted the hills under with its lovely bloom.

TO THE BOGS FOR ORCHIDS

We gathered the pink lady's slipper — the loveliest of native orchids — in the high, *dry* woods, but the orchids as a family love the low, wet places. This family all have irregular flowers, many of the tropical species growing almost without roots, in the air. No stranger, more wonderful flowers gladden our eyes than the orchids, and a walk through the great orchid houses in the neighboring town of North Easton is like a trip down the Amazon or to the land of Oz. Here is a list of some you may find.

The Yellow Lady's Slipper[2] (*Cypripedium parviflorum*) has usually one but sometimes three flowers at the summit of a leafy stem seven to twenty inches high. The inflated lip is bright-yellow, slipper-shaped, and with a rounded open orifice near the base. The two lateral petals are brownish, exceedingly twisted. The broad, bright-green leaves are very prominently ribbed lengthwise, pointed and alternately sheathing the stem. This is one of the northerly species, being found along the northern border of the United States and southern Canada. It grows in colonies and flowers from May to July, in rich woods or bogs.

Showy Lady's Slipper (*Cypripedium hirsutum*) is a magnificent orchid, usually regarded as the most beautiful of the genus. It is of imposing dimensions and comes out in fine large, fragrant flowers.

The inflated flower lip is large and balloon-like, about two inches in length; white, with crimson-magenta blotches and streaks on the front edge; the sepals are round-ovate and the petals oblong, both pointed and both greenish-white in color. The leafy stem, that bears at its summit the solitary blossom, is from one to two feet in height. Found locally from Newfoundland to Minnesota and southward to

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[1] "Nature's Garden."

[2] This and the following descriptions are largely taken from Reed's "Flower Guide."

Georgia and Missouri, flowering in rich woods during June and July.

The Small White Lady's Slipper (*Cypripedium candidum*) is of the same size and shape as that of the yellow variety, but the lip is pure white outside and striped with purple inside at the base; the two lateral sepals and the two petals are ovate-lanceolate, greenish, spotted with brown. It is a single-flowered species with numerous leaves. It is usually found in swamps from New York to Minnesota southward.

Pogonia or Snake-mouth (*Pogonia ophioglossoides*) is a delicate flower, pure pink in color and slightly fragrant. Its pollen is not in stemmed masses but is showered on the back of a visiting insect as he backs out of the flower. The stem is from eight to thirteen inches high, bearing at its top a single flower; sepals and petals are similar in shape. About midway of the flower stem is a single oval leaf, and just below the flower is a smaller, bractlike one. Pogonia grows in swamps from Newfoundland to Minnesota and southward to the Gulf of Mexico, flowering during June and July.

The Nodding Pogonia (*Pogonia trianthophora*) has a leafy stem from two to eight inches high. From two to eight small oval leaves alternately clasp the stem; the flowers, which number from one to six, appear singly from the axils of the upper leaves, nodding on slender peduncles; they are small, magenta-pink, and with ovate, three-lobed lips. It is locally distributed from Maine to Wisconsin and southward.

The Whorled Pogonia (*Pogonia verticillata*) has a single flower on a long stem, eight to twelve inches high; the sepals are greenish-yellow, long, linear, with the edges rolled or folded together; the petals are oblong-lanceolate and purple; the lip is also purple, wedge-shaped, and three-lobed, with a hairy crest down the middle. Five lanceolate and stemless leaves are on a whorl about the stem just below the flower. It is a peculiar, inconspicuous plant found locally in moist woods from Maine to Wisconsin and southward.

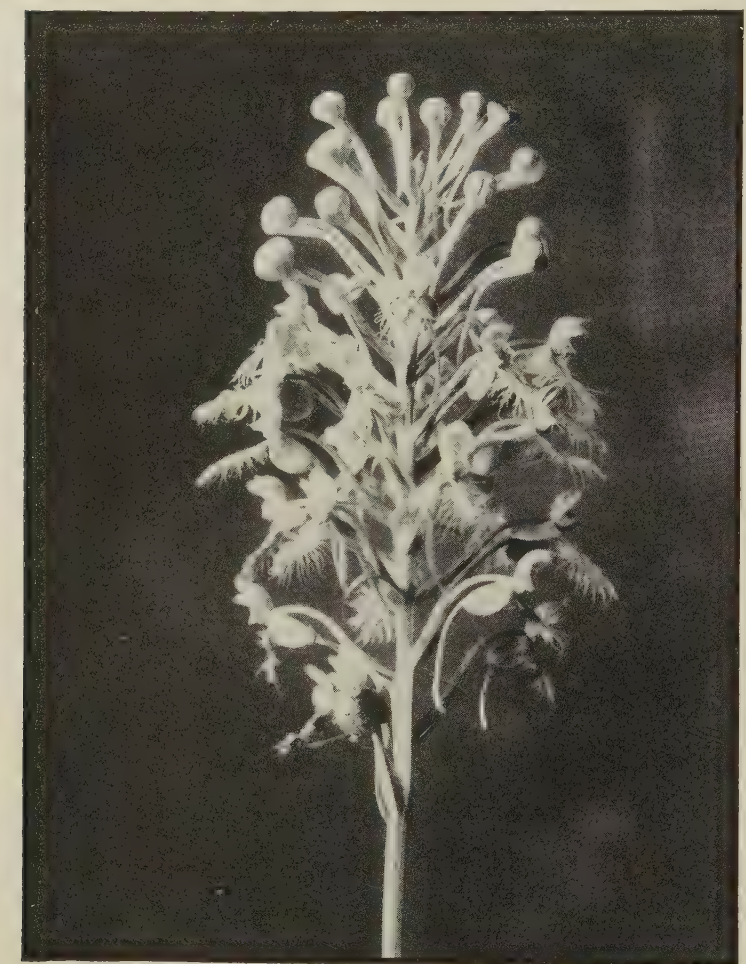
Field Mus. of Nat. Hist., Chicago

YELLOW OR DOWNY LADY'S SLIPPER
(*Cypripedium parviflorum*)

Rattlesnake Plantain is a common orchid having beautiful leaves, radiating from the fleshy, creeping rootstock. The scape is six to fifteen inches high and carries at its top densely flowered sepals and petals united to form a hood. It is found in the whole of the United States, flowering in July and August.

Ladies' Tresses (*Spiranthes cernua*) is so named because of the braided arrangement of its flowers. The leaves are few, grasslike, sheathing the scape near its base. The scape is six to fifteen inches high, has several small bracts, and ends in a two or three ranked spiral raceme of white or creamy flowers; petals and upper sepal joined, lateral sepals lanceolate; lip ovate-oblong with a rough tip. Common in moist fields or woods from Maine to Minnesota and southward.

Slender Ladies' Tresses (*Spiranthes gracilis*) is slender, has its flowers in a single-ranked, one-sided or slightly twisted raceme; lip green, with a white, wrinkled margin. Leaves small, ovate basal. Found in dry ground from Nova Scotia to Manitoba and southward.



Field Mus. of Nat. Hist., Chicago

YELLOW-FRINGED ORCHIS (*Habenaria ciliaris*)

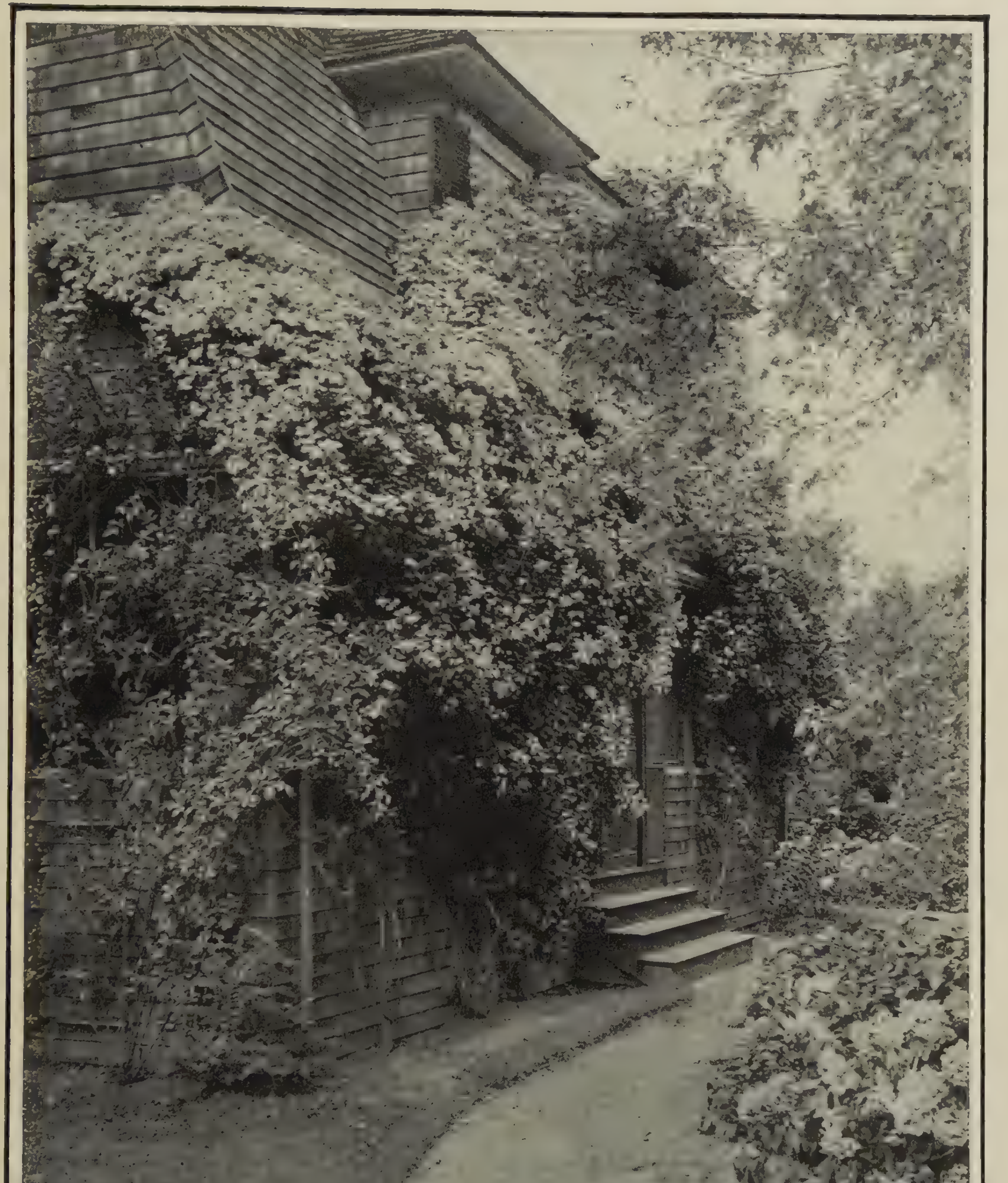
Heart-leaved Twayblade (*Listera cordata*) belongs to a genus containing five species.

Like most of the orchids, they are largely or wholly dependent upon insect aid for fertilization. The weight, or shock, of an alighting insect on the broad lip causes a small gland within the flower to rupture and cover the pollen, just below, with a sticky fluid that causes it to adhere to the head or body of the insect and thus be transferred to the next flower.

The stem of this species is from three to ten inches high. At the top is a few-flowered raceme; the sepals and petals are similar and spreading; the lip is drooping, longer, two-cleft, and madder-purple in color. This species flowers during June and July in swampy woods from New Jersey to Colorado and northward to the arctic coast.

Twayblade (*Liparis liliifolia*), although having the same common name, is of a different genus. It is a more attractive plant, having two broad basal leaves and larger flowers with a broad, ovate lip. It grows in woodland from Maine to Minnesota and southward.

Yellow-fringed Orchis (*Habenaria ciliaris*) is an attractive and rather common orchis with a tall leaf stem from twelve to twenty-four inches high. The spike is very closely set with flowers having rounded petals, fringed lips, and slender spurs about an inch in length. The leaves are lanceolate, gradually diminish-



CLEMATIS OR VIRGIN'S-BOWER (*Clematis virginiana*) ing in size as they approach the spike and passing into the flower bracts. Found from Maine to Michigan and southward.

Hooker's Orchis (*Habenaria hookeri*) has a leafless scape from six to twelve inches high, at the base of which are two broad, oval, shining, deep-green leaves. The ten to twenty flowers are yellowish-green; lip lanceolate and sharply pointed, less than half an inch long; slender spur about one inch long. Flowers during June and July in woods from Maine to Minnesota and south to North Carolina.

Round-leaved Orchis (*Habenaria orbiculata*) is similar to Hookeri; the lip is oblong, obtuse, and about the same length as the spur. The two basal leaves are almost round. It is common in rich woods from Labrador to Alaska and southward.

Ragged-fringed Orchis (*Habenaria lacera*) does not attract our attention because of its beauty, for its flowers are rather inconspicuous in color. They are, however, remarkable for the peculiarly cut and slashed lip, it being divided apparently with no regard for method or symmetry. The greenish-white flowers are in a dense, many-flowered raceme at the summit of a leafy stem from ten to twenty inches high. The leaves are oblong-lanceolate, diminishing in size to the flower bracts as they reach the raceme. This species is not uncommon in swamps from Newfoundland to Minnesota and southward.

White-fringed Orchis (*Habenaria blephariglottis*) has a densely flowered raceme or spike similar to that of the yellow-fringed species, but the flowers are pure white; the lip is not divided but is copiously fringed; lateral sepals rounded, upper ones elliptical and concave; spur nearly an inch long. Leaves lanceolate and gradually diminishing in size as they alternate to the top of the stem. In July and August you may find this species flowering, throughout the United States.

Large Purple-fringed Orchis (*Habenaria fimbriata*) is the largest and perhaps the most beautiful of the genus. The pale-purple flowers are nearly twice as large as those of the last species; the lip is more deeply fringed. The densely flowered spike is about two inches in diameter and often is twelve inches long. The leafy stem attains heights of from one to five feet. It is a magnificent plant, the sight of which is well worth the inconvenience necessary to visit its haunts. It grows in swamps throughout the United States and southern Canada.

Small Purple-fringed Orchis (*Habenaria psycodes*) has pale purplish flowers in a dense cylindrical spike terminating in a leafy stem, about one or one and one half feet tall. The spreading flower lip is three-parted and fringed; sepals rounded, petals spatulate and slightly toothed. The leaves are lanceolate and, like those of the fringed orchids, grow smaller as they approach the top of the stem. Flowers in July and August in wet meadows or swamps, from Newfoundland to Manitoba and southward.

Calopogon, Grass Pink, is an exquisite orchis with a loose raceme of four to twelve delicate pink flowers, at the top of a scape ranging from six to fifteen inches long. The flowers are apparently upside down, as the lip is at the top; it is narrow at the base but broadens into a broad hooked tip, crested on the under side. A single, grasslike leaf sheathes the flower scape near its base, as it rises from the solid bulb. It grows in deep swamps and bogs, from Newfoundland to Minnesota and south to the Gulf, flowering in June and July.

Arethusa, Indian Pink, has a solitary magenta-pink blossom topping its slender scape that rises from five to ten inches in height. The petals and sepals are similar in shape and in their proper positions at the top of the flower; the lip rises, then abruptly turns downward, broadens, and is adorned with three to five yellow and white crests; margin of lip wavy and sometimes spotted with crimson. From Newfoundland to Minnesota and south to Pennsylvania and Missouri, Arethusa has been found blooming in swamps during May and June.

These, as you will see, do not all come from the same place, nor at the same time, but in the meadows about Brockton Heights, where I lived for some time, I found as many as a dozen orchids in bloom together.

OUT TO THE SALT MARSH[1]

Let us take one trip this summer out to the salt marsh. We have already been there for

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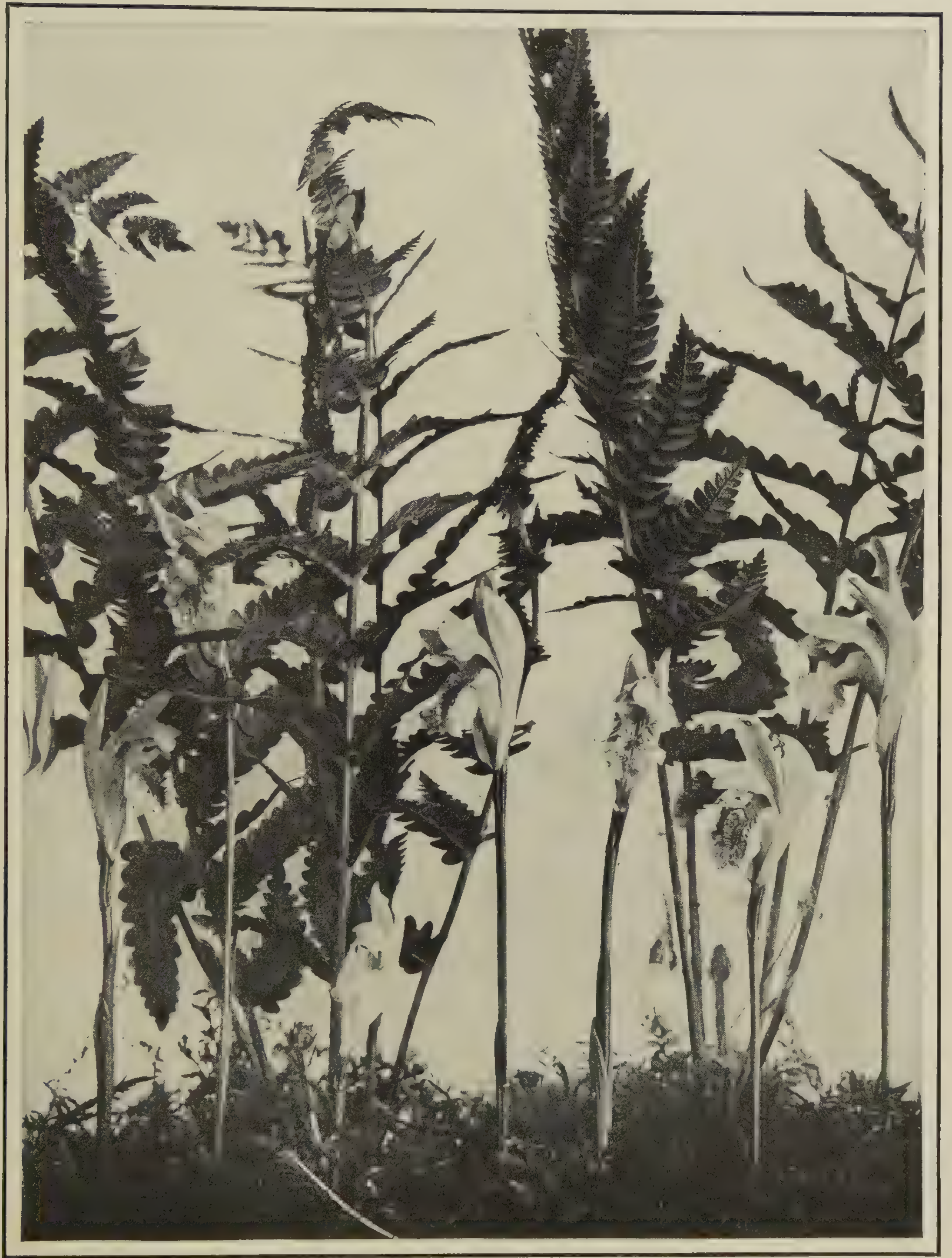
[1] From "Roof and Meadow." By permission of The Century Company.



ARETHUSA (*Arethusa bulbosa*)

Found in cold, wet bogs. Sometimes called "Indian pink."

birds; we will go now for the marsh itself — for its reaches and sedges and salty breaths.

Passing along the river bank until beyond the weeds and scrub of the higher borders, you stand with the sky-bound, bay-bound green beneath your feet. Far across, with sails gleaming white against the sea of sedge, is a schooner, beating slowly up the river. Laying your course by her, you begin to beat slowly out into the marsh through the heavy sea of low, matted hay-grass.

There is no fresh-water meadow, no inland plain, no prairie, with the rainy, misty, early morning freshness that is so constant on the salt marsh; no other reach of green is so green, so aglitter with seas of briny dew, so regularly, unfailingly fed:

"Look how the grace of the sea doth go
About and about through the intricate channels that flow
Here and there,
Everywhere,
Till his waters have flooded the uttermost creeks and the low-lying lanes,
And the marsh is meshed with a million veins!"

A Western wheat field, halfway to head, could look, in the dew of morning, somewhat like a salt marsh. It certainly would have at times the purple-distance haze, that atmosphere of the sea which hangs across the marsh. The two might resemble each other as two pictures of the same theme, upon the same scale, one framed and hung, the other not. It is the framing, the setting of the marsh that gives it character, variety, tone, and its touch of mystery.

For the marsh reaches back to the higher lands of fences, fields of corn, and ragged forest blurs against the hazy horizon; it reaches down to the river of the reedy flats, coiled like a serpent through the green; it reaches away to the sky where the clouds anchor, where the moon rises, where the stars, like far-off lighthouses, gleam along the edge; and it reaches out to the bay, and on, beyond the white surf line of meeting, on, beyond the line where the bay's blue and the sky's blue touch, on, far on.

Here meet land and river, sky and sea; here they mingle and make the marsh.

A prairie rolls and billows; the marsh lies still, lies as quiet and as even as a sleeping sea. Yet what moods! What changes! What constant variety of detail everywhere! In the "Marshes of Glynn" there was

"A league and a league of marsh grass, waist-high, broad in the blade,
Green, and all of a height, and unflecked with a light or a shade."

But here, to-day, the sun may be blazing, kindling millions of tiny suns in the salt-wet blades; and instead of waist-high grass, there may lie around you acres and acres of the fine rich hay-grass, full-grown, but without a blade wider than a knitting needle or taller than your knee. It covers the marsh like a deep, thick fur, like a wonderland carpet into whose elastic, velvety pile your feet sink and sink, never quite feeling the floor. Here and there are patches of higher sedges, green, but of differing shades, which seem spread upon the grass carpet like long-napped rugs.

Ahead of you the even green breaks suddenly over a shoal of sand into tall, tufted grasses, into wild rose, great gorgeous mallow, and low bushes, foaming, on nearer view, with spreading dogbane blossoms. Off toward the bay another of these shoals, molehill high in the distance, runs across the marsh for half a mile, bearing a single broken file of trees — sentinels they seem, some of them fallen, others gaunt and wind-beaten, like broken masts.

In its blended greens the marsh offers one of the most satisfying drinks of color that my eyes can ever taste. The areas of different grasses are often acres in extent, so that the tints, shading from the lightest pea-green of the thinner sedges to the blue-green of the rushes, to the deep emerald-green of the hay-grass, merge across their broad bands into perfect harmony.

As fresh and vital as the color is the breath of the marsh. There is no bank of violets stealing and giving half so sweet an odor to my nostrils, outraged by a winter of city smells, as the salty, spray-laden breath of the marsh. It seems fairly to line the lungs with ozone. I know how grass-fed cattle feel at the smell of salt. I have the concentrated thirst of a whole herd when I catch that first whiff of the marshes after a winter, a year it may be, of unsalted inland air. The smell of it stampedes me. I gallop to meet it, and drink, drink, drink deep of it, my blood running redder with every draught.

It is not for the flowers that one would first seek the marshes, but for the grasses and sedges; yet here are found blossoms that it will pay to journey far to see.

One of the curious sights is the spreading dogbane, whose pink-white flowers are covered usually with the carcasses of mosquitoes,—*males*, all of them, I am sorry to say — that have been here tippling (the females indulge in nothing stronger than warm human blood) and either found it poison or were caught in the sticky hairs.

Spreading Dogbane grows from one to four feet high, and has many long, spreading branches.

Beggar-ticks, Stick-tight (*Bidens frondosa*), is a familiar plant, with little two-hooked, black seeds that hang so closely to clothing and is usually found in the marsh.

Larger Bur-marigold, Brook Sunflower (*Bidens lævis*), is a very attractive species while it is in flower, but later, after the little seeds have formed, it has the same disagreeable traits common to all the members of the genus.

These, like so many plants of the marsh, are found in wet woods and fresh meadows; but here they seem to feel the room given them and grow accordingly.

The Swamp Rose (*Rosa carolina*) is very common throughout the marsh and, of course, is familiar to everyone. The swamp rose is a bushy member, growing from one to nine feet high.

The flowers are two or three inches broad and have numerous yellow stamens radiating from the greenish-white center. The stem of the swamp rose is sparingly armed with stout, wide-based, curved thorns. The sparrows use it for nesting sites, especially as it grows on the higher spots and so keeps the nest above the occasional very high tide.

Running up and over the banks, tangling the rosebushes and sluice stakes, is the bindweed.

Wild Morning-glory. Convolvulus Family. The large, funnel-shaped blossoms grow singly on slender peduncles from the axils of the leaves. The flowers remain open only during sunshine and occasionally on bright moonlight nights. It is very commonly found in moist ground along roadsides or the borders of woods or thickets, throughout our range and also in Europe.

But the real glory of the marsh is the rose-mallow.

Swamp Rose-mallow, Mallow Rose. Mallow Family. "The gorgeous pink, flaring, bell-shaped flowers of the so-called 'marsh mallow' may be seen near the edges of brackish marshes during midsummer along the Atlantic coast from Massachusetts to Florida and Louisiana, and also inland in the Great Lake region. They look like their cousins the hollyhocks. There is a certain tropical air about the rose-mallow that impresses one with its grandeur. It is so large and stately, so fresh and lovely, so prosperous and beautiful, this tall, handsome plant, that one cannot well resist the temptation to become better acquainted with it. But this is not altogether an easy matter, because it chooses to keep aloof from inquisitive mortals and has a tantalizing way of growing just beyond one's reach in the deep, treacherous quagmire where it is found.

One does not need to visit the marsh for the meadow beauty, but here it is often in such quantities as to make a gorgeous show.

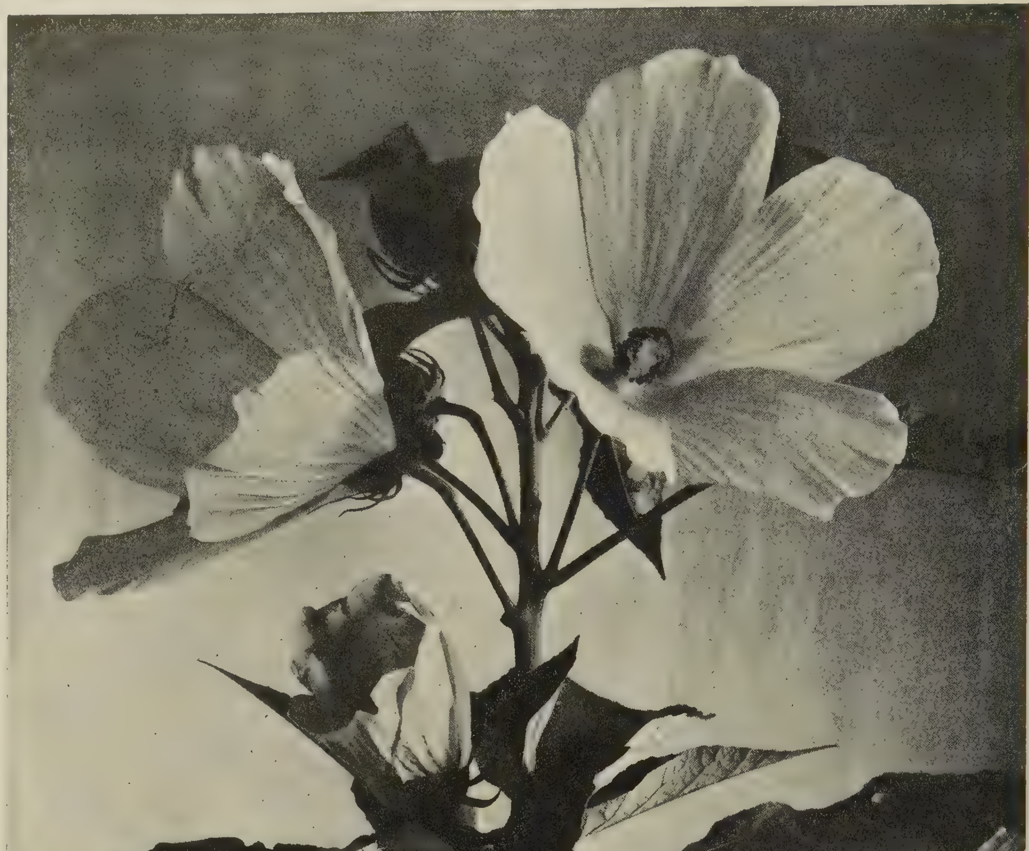
Meadow Beauty. Melastoma Family. A pretty little plant that always causes a thrill of admiration to pass through us as we come across it in grassy marshes where other flowers are usually few and far between.

Meadow beauty or "deer grass" is a perennial, has a stout stem, quite branching, and sharp-pointed, ovate, toothed leaves. The flowers have four large, rounded, magenta petals, each with a short, sharp point at the tip.

Another showy pink flower of the marsh is the sabbatia.

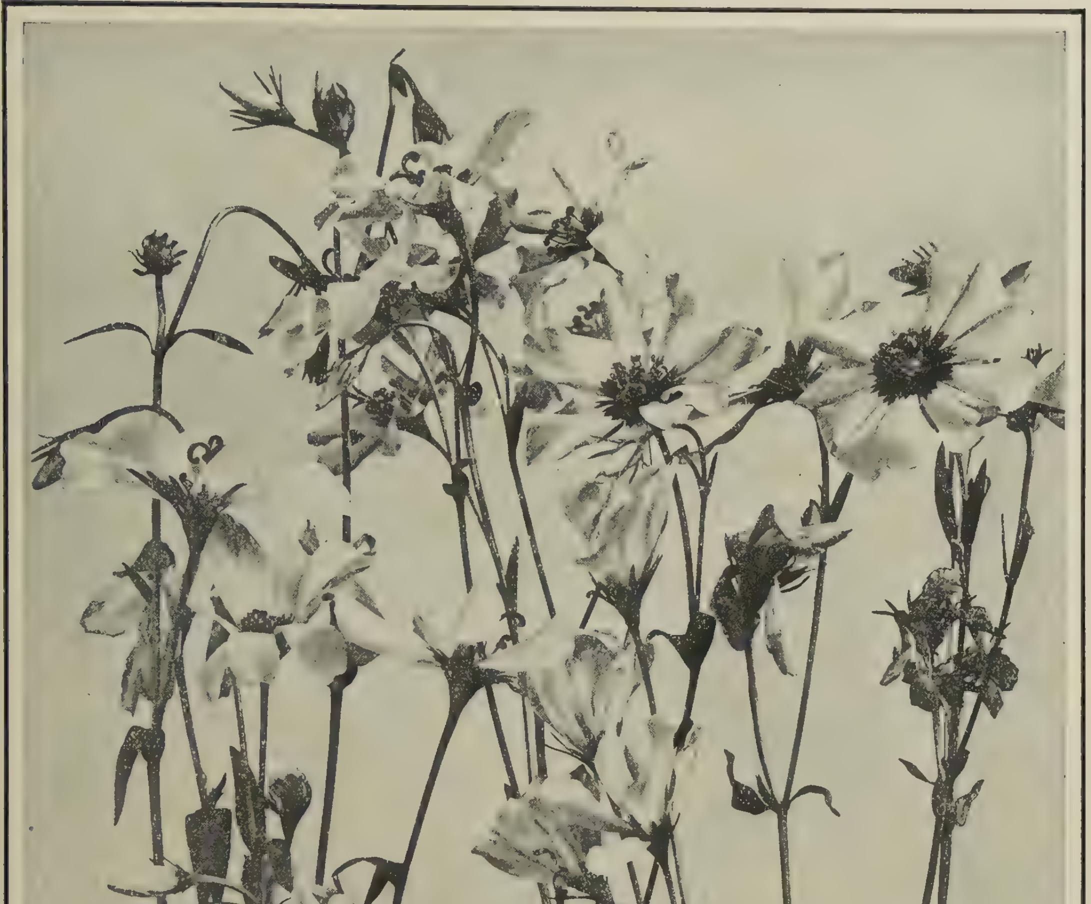
Large Marsh Pink, Sabbatia, is "the largest-flowered and the most beautiful species of this genus; in fact, it is one of the most delicately beautiful members of our wild-flower family.

"During July and August, along the Atlantic coast, we sometimes find brackish ponds, the shores and muddy flats of which have a ruddy glow owing to the number of these large, attractive blossoms that appear. The stems are slender and wiry, and but little branched; they attain heights of one to two feet, each branch bearing usually but a single blossom."



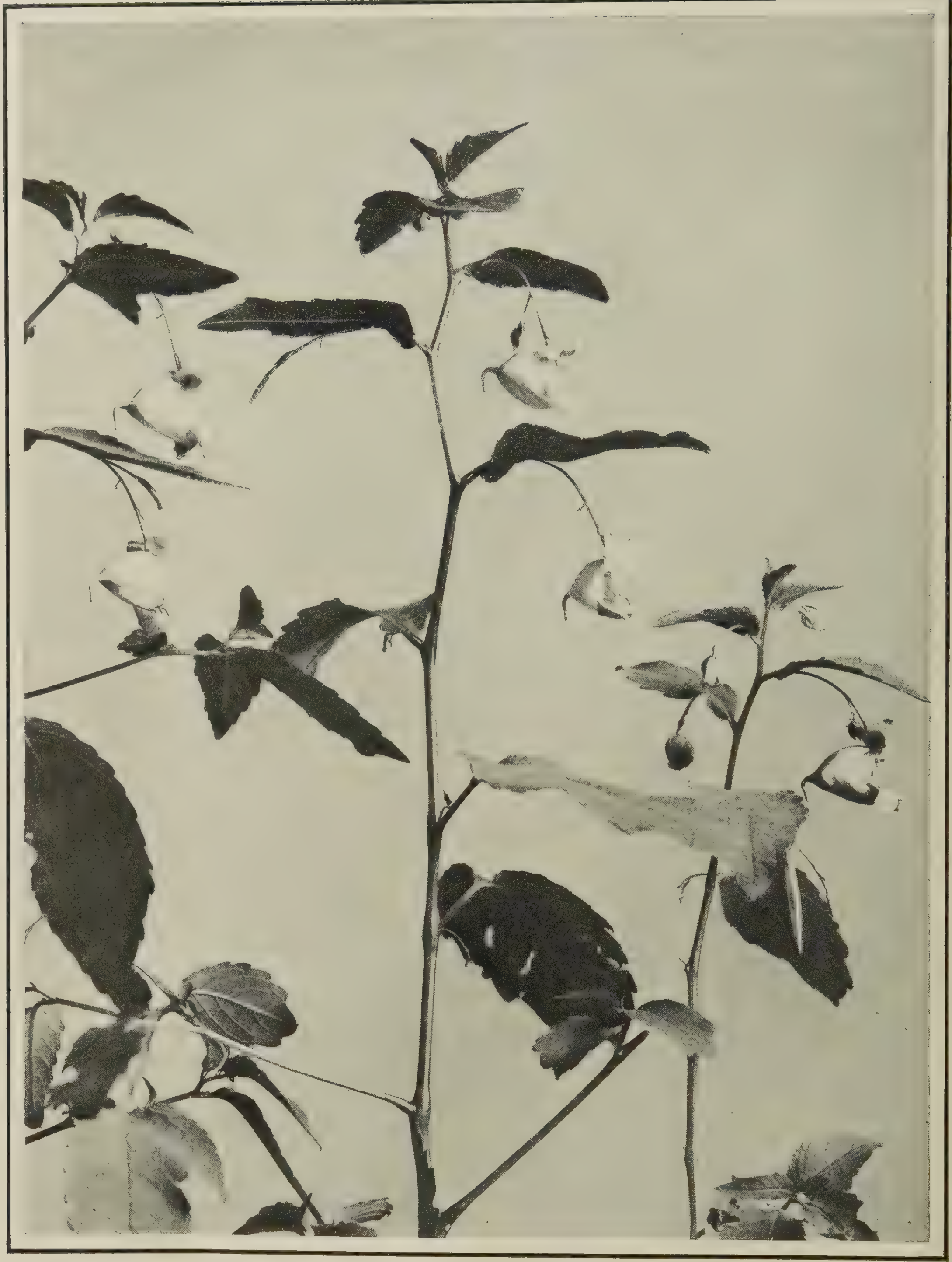
SWAMP ROSE-MALLOW (*Hibiscus moscheutos*)

The gorgeous salmon-pink blossoms measure nearly four inches across. While its natural habitat is the salt-water marshes, occasionally it has adapted itself to the soil along the banks of fresh-water rivers and lakes.



SABBATIA (*Sabatia dodecandra*)

Another salt-marsh plant.



JEWELWEED (*Impatiens pallida*)

The flowers are pale-yellow, sparingly dotted with brown. The plant is often called the "touch-me-not," on account of its pods' curling up and exploding when they are touched. It grows in all moist, shady places. This photograph is of the less common of the two species.

Ewing Galloway

JULY — HIGH NOON[1]

LAZILY sailing clouds, and between them, far away, the illimitable blue! And how blue, how cool, how far away! Never does the sky seem of so real azure, so fresh and new, but so mysteriously distant, as upon such a July day as this; and never does the earth seem so warm and near. I lie outstretched upon it as close as I ever lay upon my mother's breast. I feel the crisp moss beneath me, the creeping of the beetle under my shoulder, the heat of the gray stone against my side. I throw out my hands, push my fingers into the hot soil, and feel them take root. Mother Earth! The clouds sail on; the bending blue recedes; and — heaven? It matters not. Here are my brothers — the stones and beetles — and here are my sisters, the flowers.

High noon! and the red wood lily is aflame in the old fields, and in the low tangles of sweet fern and blackberry that border the upland woods.

The wood lily is the flower of fire. How impossible it would be to kindle a wood lily on the cold, damp soil of April! It can be lighted only on this kiln-dried soil of July. This old hilly pasture is baking in the sun; the low moldy moss that creeps over its thin breast crackles and crumbles under my feet; the patches of sweet fern that blotch it here and there crisp in the heat and fill the smothered air with their spicy breath; while the wood lily opens wide and full, lifting its spotted lips to the sun for his scorching kiss. See it glow! Should the withered thicket burst suddenly into a blaze, it would be no wonder, so hot and fiery seem the petals of this flower of the sun.

How unlike the tender, delicate, fragrant flowers of spring are these strong flowers of the coming fall! They make a light bank along the stream — milkweed, boneset, peppermint, turtlehead, Joe-pye weed, jewelweed, smartweed, and budding goldenrod! Life has grown lusty and lazy and rank.

Joe-pye Weed. Look at Joe-pye weed, attaining heights of from two to ten feet. The stem is usually stained purplish and is set at intervals with whorls of three to six rough, coarsely toothed leaves; these latter have short stems, rather broad bases, and are sharp pointed. The flowers grow in flat-topped terminal clusters. Each floret is of a rosy purple color and has protecting styles that give the flowers a very fuzzy appearance.

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[1] From "The Lay of the Land."

Copyright, Boston Photo News Co.

A BROOK THROUGH THE MARSHES

Joe-pye weed is commonly found in moist places from Newfoundland to Minnesota and southward, flowering during August and September.

Along the road by the brook and in every open meadow glade the rich, rank flower spreads itself to the summer sun and offers itself to my honey-making bees.

And with it grows its white sister, the still ranker, coarser boneset, that used to hang in bunches under the rafters of my grandmother's attic.

Thoroughwort, Boneset. This is a flowering herb, dearly beloved by the old-fashioned housewife and equally detested by the small boy. It was, and still is, one of the most commonly used home remedies. The stem is stout, hairy, and one to five feet tall. The opposite leaves are perfoliate — that is, the ends are joined together, which is one of the curious leaves of the fields.

Overhanging the stream, mingling with the Joe-pye weed and boneset, is the third most conspicuous flower of the brookside in July — the jewelweed, or touch-me-not.

"These exquisite, bright flowers, hanging like jewels from a lady's ear, may be responsible for the plant's folk name; but whoever is abroad early on a dewy morning, or after a shower, and finds notched edges of the drooping leaves hung with scintillating gems, dancing, sparkling in the sunshine, sees still another reason for naming this the jewelweed. In a brook, pond, spring, or wayside trough, which can never be far from its haunts, dip a spray of the plant to transform the leaves into glistening silver. They shed water much as the nasturtiums do."[1]

The Jewelweed, Spotted Touch-me-not, is a common rank-growing herb with a stout but fragile branching stem. The large, inflated flower sac, which is really one of the three sepals, is orange-yellow, spotted with brown. Two of these singular flowers droop from the ends of each threadlike peduncle, but only one flowers at a time.

The slim seed pod is the cause of two very commonly applied names — touch-me-not and snapweed. When nearly ripe, these pods can scarcely be touched but what they will suddenly, almost explosively, burst and scatter their seeds in all directions. One not acquainted with their ways is always startled when he accidentally brushes against the mature touch-me-not.

The leaves are very delicate in appearance, and their light, slender stems are almost translucent.

Fourth in this crowd of weeds — not weeds either — along the summer streams is the curious turtlemouth or snakehead.

The Turtlehead is a moisture-loving plant found in swamps.

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[1] "Nature's Garden."

"The stem is stout, smooth, and erect, from one to three feet tall. The leaves are lance-shaped, stemmed, pointed, and toothed. The flowers are clustered in a short spike at the summit of the stem, the corolla is tubular, about an inch in length, and is white, tinged with pink. The upper lip is broad, arched, creased, and notched in the middle; the lower lip is three-lobed and woolly-bearded in the throat. Turtlehead blooms from July until September and ranges from Newfoundland to Manitoba and southward."[1]

And with them, but scattered in clusters here and there, is the swamp milkweed, a plant that so closely resembles the others of its family as to be readily recognized. It looks much like the common milkweed.

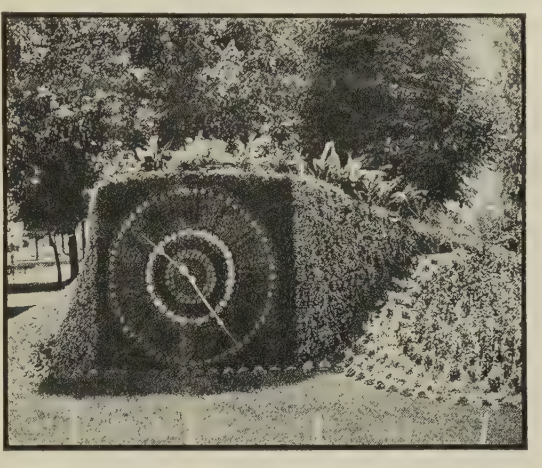
Common Milkweed (*Asclepias syriaca*) is the most abundant and the best known of them all. It grows everywhere along roadsides, in fields, and on the borders of woods. "The rather stout stem rises from two to five feet high and has numerous opposite, large, oblong, short-stemmed leaves of a yellow-green color. Both the leaves and the stem are finely hairy and both yield quantities of a thick, sticky, bitter, milky fluid if they are broken or bruised anywhere.

"The flowers grow in rounded clusters often in a pendant position, from the axils of the upper leaves. They are very fragrant and secrete an abundance of nectar.

"In the fall, the clusters of lilac-colored flowers have been replaced by large, rough-coated seed pods that are completely filled with the silkiest of flossy substance attached to the numerous black seeds; finally the pod bursts and liberates the seeds, each floating away on the breeze, sometimes aviating for several miles before coming to earth."[1]

The Butterfly Milkweed (*Asclepias tuberosa*) is one of the rarer members of its family, but grows in big clumps, so that you can see it in bloom for half a mile away. The great umbels of its brilliant tropical *orange*-red are the most visited by insects of anything that blossoms, I believe. A constant cloud of fluttering wings hover over its burning blossoms every hour of the sunshine. If the red wood lily is a tongue of flame, this burning bush is a bonfire of blossoms — a bonfire made to attract its insect admirers.

The Tall Meadow Rue. What a contrast are the tall, misty, cool-blown sprays of the white, swaying meadow rue! The butterfly weed grows along the field fences in the hottest, driest soil; the tall meadow rue grows along the roadsides where they dip into the damp hills and valleys. Here it overreaches the tallest of its neighbors. I have cut it six feet high.



A FLOWER CLOCK. THIS UNIQUE TIMEPIECE ACTUALLY RUNS AND KEEPS GOOD TIME

The stalk is rather stout and grooved, pale-green, stained with maroon. The long-stemmed leaves are many times compounded into small, lobed leaflets of a pale, dull, blue-green color. The flowers are in feathery clusters, each individual flower having numerous white filaments, no petals, but usually four or five early-falling sepals.

The Steeplebush or Hardhack (*Spiræa tomentosa*). I said life had grown lusty and rank since the spring. Look at the pink steeplebush on its stiff, woody stems standing in pointed spires all over the meadow. A single spray of it is lovely beyond measure, and a whole meadowful, especially a rocky New England pasture, is lovely too with its plumy pink; but it is the last flower that for itself anyone would gather. Yet it and its cousin, the whiter, fleecier meadowsweet, play a large part in my July landscape.

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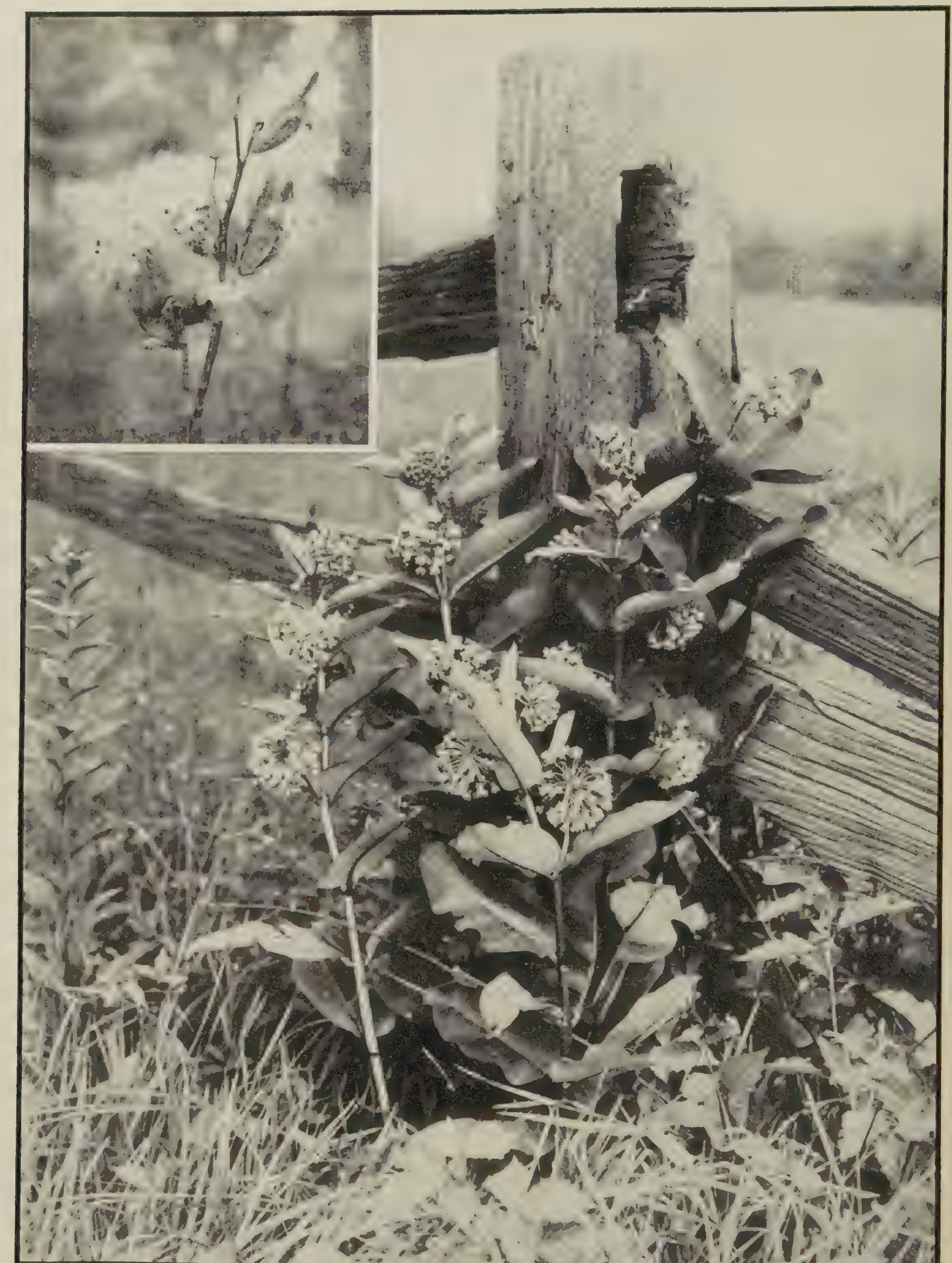
[1] Reed's "Flower Guide."



Courtesy of Field Museum of Natural History, Chicago

COMMON MILKWEED (*Asclepias syriaca*) IN FLOWER. INSET: SEED PODS OF THE COMMON MILKWEED

Meadowsweet (*Spiræa latifolia*) is a common and beautiful shrub that grows along the edges of woods, pastures, or even roadsides. Its handsome pyramidal clusters of flowers are in evidence during July and August. The stem is straight, slender, woody, and purplish-brown; along it, at close intervals, alternate the lanceolate, toothed, short-stemmed leaves. At the top is a spirelike panicle of fleecy flower clusters. Each flower has five round, white petals and numerous long, pink stamens that give the flowers a feathery appearance and a rosy tint. It ranges throughout eastern North America southward to Virginia.

L. W. Brownell

JOE-PYE WEED (*Eupatorium purpurium*)

As we leave the meadow stream with all the goldenrods in bud among the boneset, and cross the road to where the fire ran through the woods two summers ago, we find the bees buzzing about the long, pink tubes of the tall fireweed. It has swept in behind the blackening fire and covered the charred remains of the woodside with a robe of rich magenta.

Great, Spiked Willow-herb or Fireweed. Evening Primrose Family. "It grows in low grounds, especially in recent clearings and newly burned-over lands, where the tall, showy, swaying, magenta spikes attract our attention during June, July, and August, from coast to coast. So promptly and persistently does it follow in the destructive tracks of fire and ax that I have often thought this phœnix of our woodlands raised its brilliant danger signals as a silent protest and warning against the reckless devastation of our depleted forests.

"The flower is set atop a slender, silky, crimson or purple-stained pod. The buds succeed each other closely and graduate in size as they approach the tip of the curving spike. They are hung upside down, and become erect as the flower opens. The arrangement is loose and terminal. After the flower fades, the curving pod continues to lengthen, and when it is ripe it splits asunder lengthwise, in grotesque fashion and every which way, liberating a very fine, silky, webby mass of soft, fluffy down to which are attached the tiniest seeds. These small particles float away with the breezes."[1]

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[1] "Wild Flowers Every Child Should Know."

Farther on, in the open woods, we find that strangely beautiful plant, the foxglove.

Downy False Foxglove. Figwort Family. "This plant is partly parasitic, absorbing part of its nourishment from the roots of other plants with which its own roots come in contact. The lovely large, yellow, deeply tubed flowers are very showy, and blossom during July and August in dry, open woods and thickets. It is a downy, grayish perennial, growing from two to four feet high, and is leafy and usually unbranched. The square, hollow stalk is quite brittle, and when fully flowered it often assumes a slanting position, due probably to its top-heaviness, and on account of the buds and blossoms flaring to one side. The thick, velvety, yellow-green leaves are borne in opposite pairs, which are set alternately upon the stalk with short, purple-stained stems.

"The beautiful flowers are crowded on the stalk in a lovely terminal, leafy spike, several blooming at the same time. This foxglove is found from Maine to Ontario, Wisconsin, and Iowa, south to New York, Georgia, and Mississippi."[1]

Last summer I saw a hillside along Tillamook Bay, Oregon, covered with foxgloves six feet high and higher — a wonderful sight. Let me slip a picture of it in here.

I am beginning to feel that my sermon grows long again and that you wish it were August or Christmas. But here is chicory, the roadside dump-heap missionary for the uplift of all downhearted foot-weary mortals who will lift their eyes above their feet.

"On cloudy days or in the morning only throughout midsummer the 'peasant posy' opens its 'dear blue eyes.'

> "Where tired feet
> Toil to and fro;
> Where flaunting Sin
> May see thy heavenly hue,
> Or weary Sorrow look from thee
> Toward a tenderer blue!
> MARGARET DELAND.

"In his 'Humble Bee,' Emerson too sees beauty in the

> "Succory to match the sky."[2]

And here is the *blue* cardinal flower.

Blue Cardinal Flower or Great Lobelia. "Constantly and invidiously compared with its gorgeous sister the cardinal flower it suffers unfairly. When asked what his favorite color was, Eugene Field replied, 'Why, I like any color at all so long as it 's red!' The majority of men, at least, agree with him, and certainly humming birds do; our scarcity of red flowers being due, we must believe, to the comparative scarcity of humming birds, which chiefly fertilize them. But how bees love the blue blossoms!"[2]

By H. T. Bohlman

FOXGLOVE GROWING WILD, OREGON COAST

Go home without butter-and-eggs (*Linaria*), and St. John's wort (*Hypericum*), and black-

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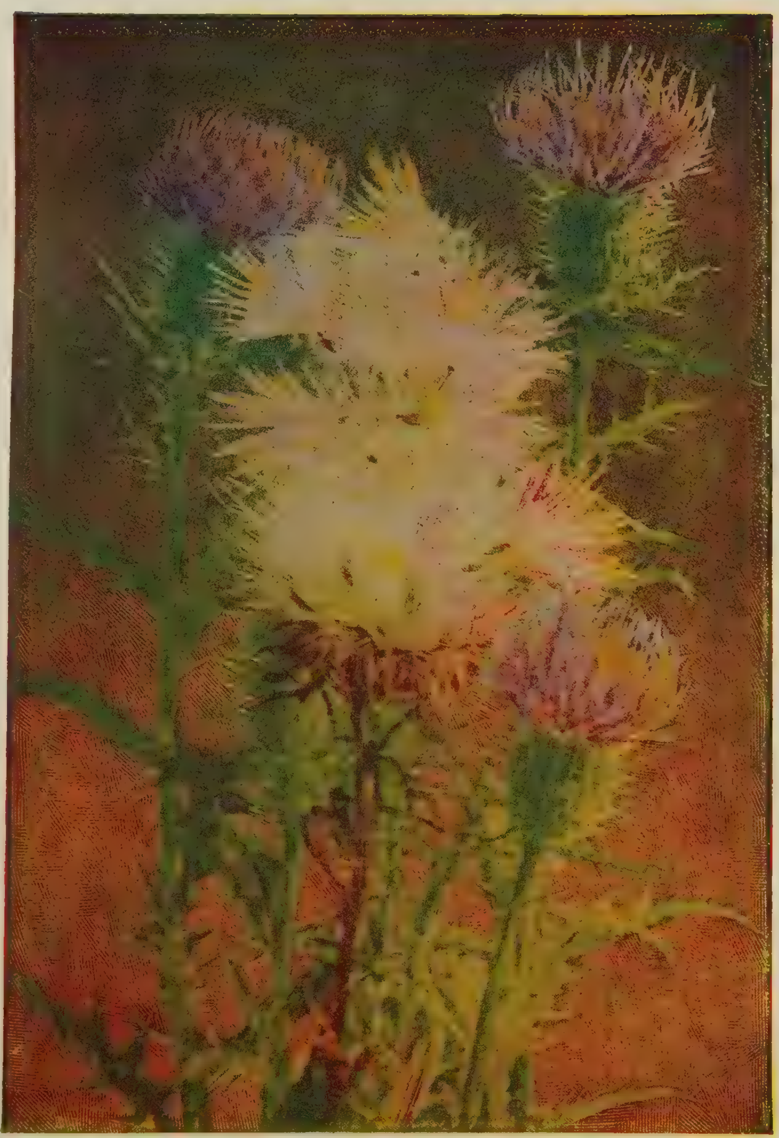
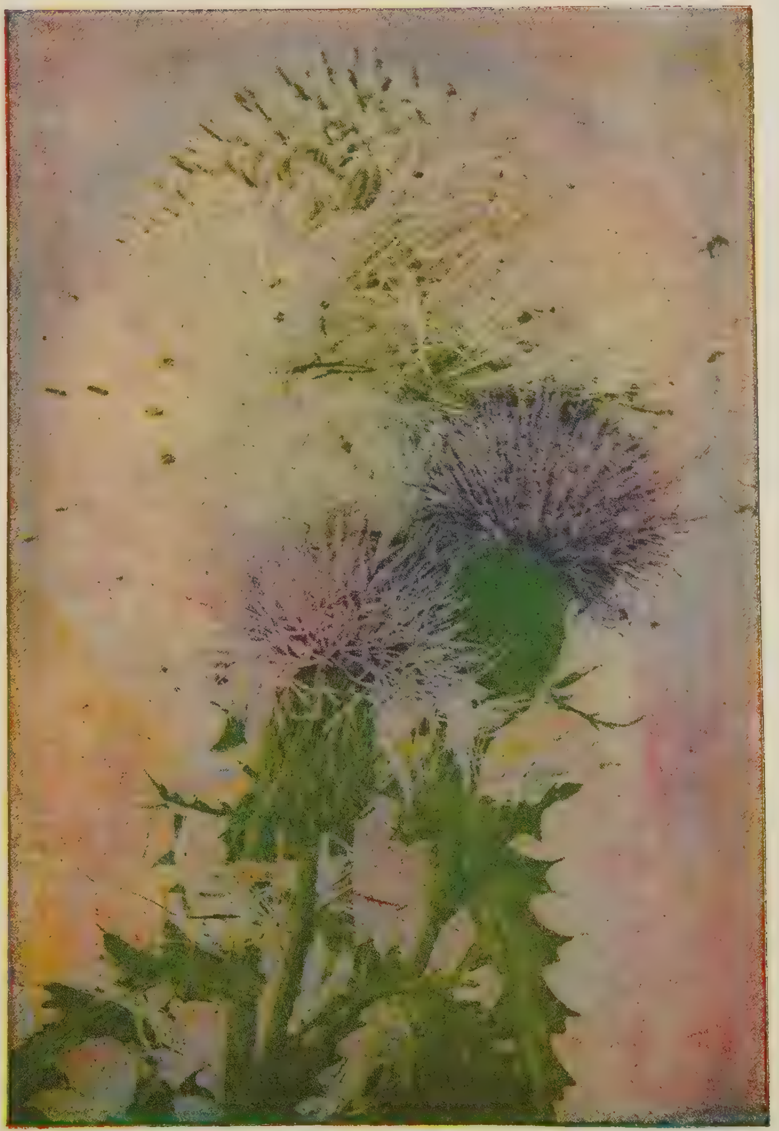
[1] "Wild Flowers Every Child Should Know."

[2] "Nature's Garden."



BURR OR SPEAR THISTLE



By Permission of Doubleday, Page & Co.

PASTURE OR FRAGRANT THISTLE

eyed Susans (*Rudbeckia*), and the moth mullein (*Verbascum*), and the thistles?

Thistles. Yes, yes, I will call a halt at these two terrible but beautiful thistles.

"From July to November blooms the common, burr, spear, plume, bank, horse, bull, blue, button, bell, or roadside thistle (*Circium lanceolatus* or *Circium lanceolatum* of Gray), a native of Europe and Asia, now a most thoroughly naturalized American from Newfoundland to Georgia, westward to Nebraska. Its violet flower heads, about an inch and a half across, and as high as wide, are mostly solitary at the ends of formidable branches, up which few crawling creatures venture."[1]

The pasture thistle, whose range is only from Maine to Delaware, blooms from July to September.

But instead of thistles it were better to stop with some tea — Oswego tea, or beë balm — whose gorgeous, glowing heads must arrest us. The bracts and upper leaves often take on blood-red color too, "as if it had dripped from the lacerated flowers. Where their vivid doubles are reflected in a shadowy mountain stream, not even the cardinal flower is more strikingly beautiful. Thrifty clumps transplanted from Nature's garden will spread about ours and add a splendor like the flowers of salvia, next of kin, if only the roots get a frequent soaking."

But you will let me stop to look at one more flower, or weed, as we pass.

Great Mullein, Velvet, or Mullein Dock, Flannel-leaf, Aaron's Rod. Figwort Family. "The great mullein erects its tall, stiff shafts here and there, like so many floral lighthouses, guarding our dry fields and rocky hillsides, or guiding various insect aëroplanists by the irregular glint of its constantly changing blossoms. The Roman *candelaria*, a torch used in funeral ceremonies, was made from dried mullein stalks dipped in melted suet. The leaves were formerly used for lamp wicks by the Greeks."[2]

All over my hilltop it grows, and so abundantly that for generations now the hill where my house stands has been known as Mullein Hill.

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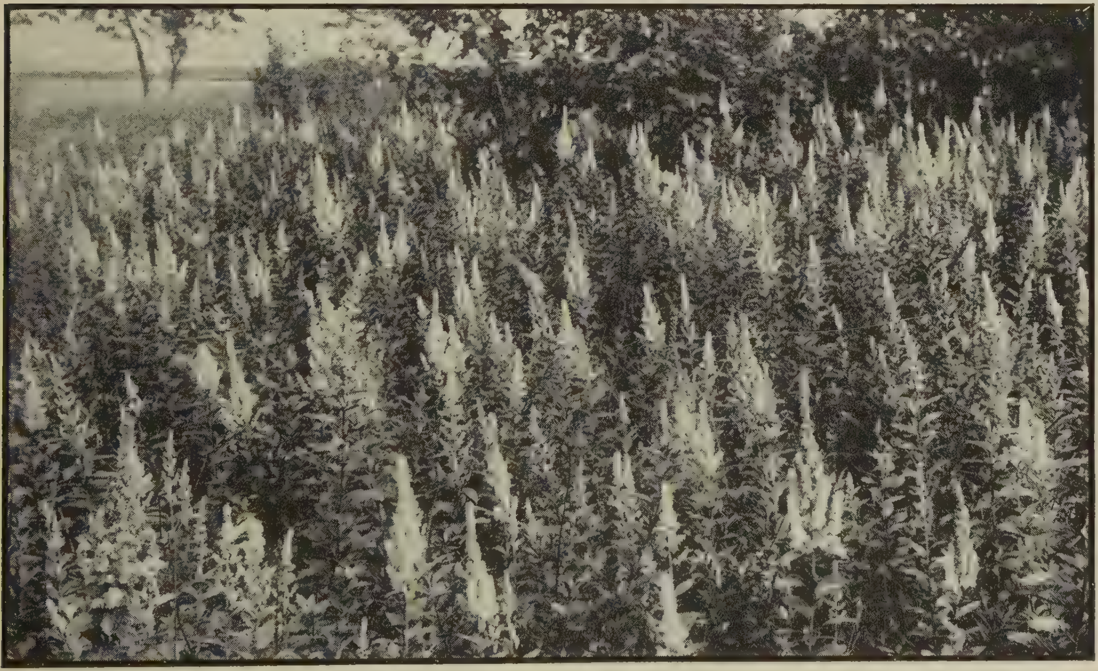
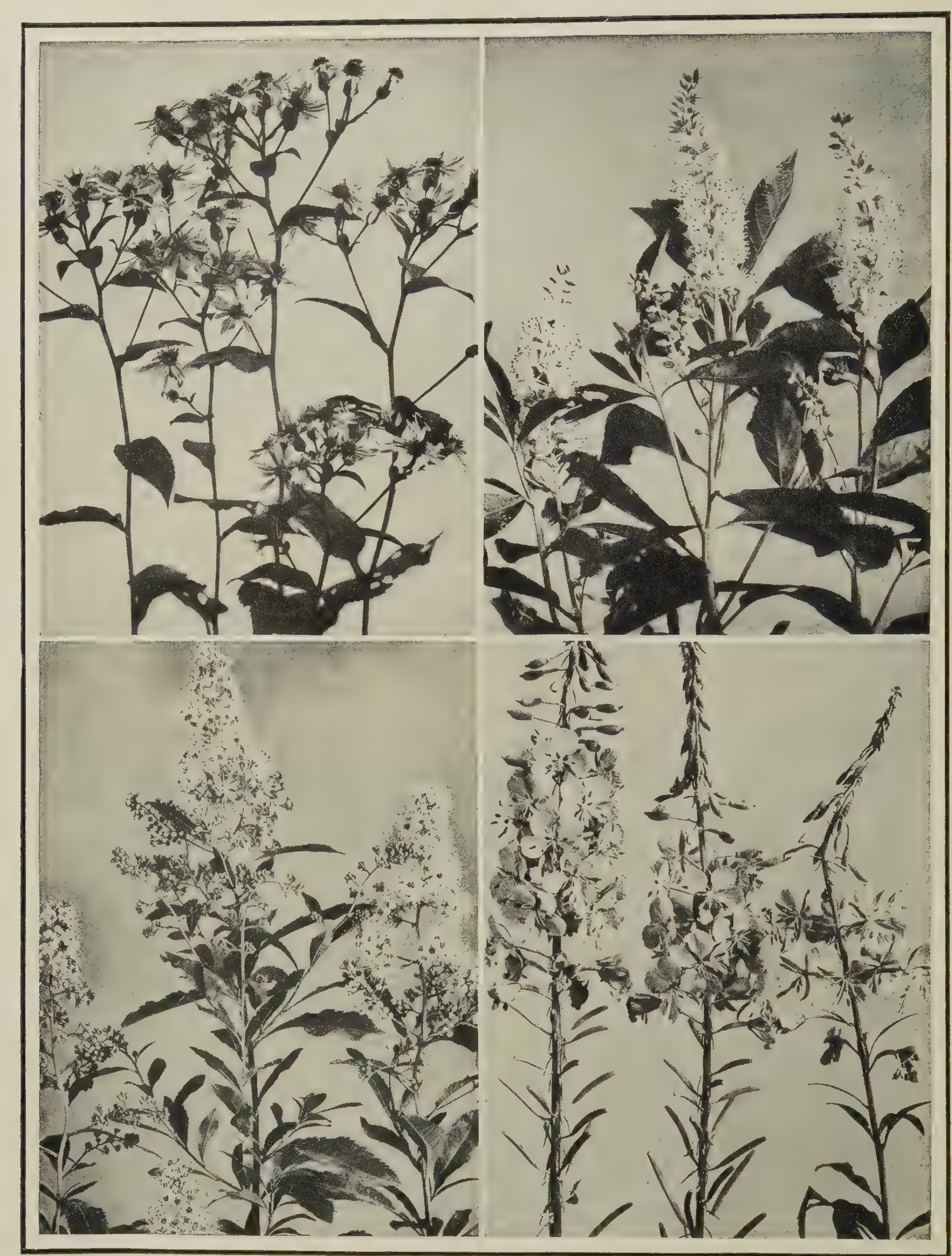
[1] "Nature's Garden."

[2] "Wild Flowers Every Child Should Know."



L. W. Brownell

STEEPLEBUSH OR HARDHACK (*Spiræa tomentosa*)



A GROUP OF AUGUST FLOWERS

Upper left: Aster (*Aster macrophyllus*). Upper right: Sweet pepper bush (*Clethra alnifolia*). Lower left: Meadowsweet (*Spiræa latifolia*). Lower right: Fireweed (*Epilobium angustifolium*).

AT THE CIDER MILL

AUTUMN!

AND the goldenrods and asters are in bloom. Autumn! and the winged seeds are drifting for the summer that is next to come.

> A haze on the far horizon,
> The infinite tender sky,
> The ripe, rich tint of the corn fields,
> And the wild geese sailing high,
> And all over upland and lowland
> The charm of the goldenrod —
> Some of us call it Autumn,
> And others call it God.
>
> William H. Carruth.

Summer turns into autumn for me when I come upon the long, white spikes of the sweet pepper bush in the swamp. That is usually the first week in August. It was on the seventh of August this summer that I put the "supers" on the beehives to catch the white honey of the sweet pepper bush or clethra. I live here in the woods where there is no white clover, so that all my white honey is gathered from this beautiful bush of the swamp, and in three weeks this summer *one* colony of bees stored sixty-four pounds of it!

I said in the July walk that life had grown lusty and rank. Do you know the reason why?

But life has to grow lusty and rank, for the winter is coming; and as the woodchucks are eating and eating, enough to last until spring comes again, so the plants are storing fat in their taproots, and ripening millions of seeds, to carry them safely through the long months of winter.

The autumn is the great planting time out-of-doors. Every autumn wind is a sower going forth to sow. And he must have seeds, and to spare — seeds for the waysides for the winter birds to eat, seeds for the stony places where there is no depth of soil for them, seeds for the plowed fields where they are not allowed to grow, seeds for every nook and corner in order that somewhere each plant may find a place to live and its kind continue from year to year.

Look at the seeds of the boneset, Joe-pye weed, milkweed, and goldenrod! Seeds with wings and flowers and parachutes that go floating and flying and ballooning —

"Over the fields where the daisies grow,
Over the flushing clover,
A host of the tiniest fairies go —
Dancing, balancing to and fro,
Rolling and tumbling over.

"Quivering, balancing, drifting by,
Floating in sun and shadow —
Maybe the souls of the flowers that die
Wander, like this, to the summer sky
Over a happy meadow."

So they do. They wander away to the sky, but they come down again to the meadow to make it happy next summer with new flowers; for these are the seed souls of thistles and daisies and fall dandelions seeking new bodies for themselves in the warm soil of Mother Earth.

There are twenty-five different goldenrods in blossom over the woods and fields, and twenty different asters. The goldenrods and asters are the crown of the floral year, and will pay you well for all the care and study you can bestow upon them.

This is the time to gather your bouquet of weeds; and if you don't believe you can make them into a bouquet, read John Burroughs's chapter in "Pepacton" called "A Bunch of Herbs."

Here are the big, burly docks and the weeds — even the monstrous Jimson weed — and all the ragged host of the composite family.

There is little beauty, fragrance, or even economic value in this wild, overrunning host of thistles, docks, daisies, plantains, yarrows, carrots, that now possess the earth; but when they crowd out along the dusty roadsides and cover the sterile, neglected, and unsightly places, we can sing, like the good gray poet, "the leaves and flowers of the commonest weeds" in our "Song of Joys."

There is certainly some praise due the chicory, or blue cornflower, for it is a waste transformer, a "slummer" among flowers, if ever there was one. Like the daisy, it is a foreigner; but unlike the daisy, its coming is wholly benevolent. It asks only the roadsides, and for these along only the choked, deserted stretches, and where the summer dust lies deepest. Coarse, common, weedy, it doubtless is; but it never droops in the heat, and its blue shines through the smother like azure through the mists of the sky.

And so it is too with many another. Perhaps you will all agree that the most brilliant thing of all the year is the cardinal flower, that flame of flames beside the autumn streams. The season touches up her landscape picture with her highest, richest lights in the autumn foliage, but she overdoes all others of her colors in the cardinal's vivid, velvety hue.

"The simple stem grows to heights of two to four feet from perennial creeping rootstocks that often throw up new plants; the stalk is hollow and rather closely set with alternating lance-shaped leaves, the lower ones stemmed and toothed, the upper ones clasping the stem and nearly smooth-edged. The showy flower spike is loosely set with bright-red flowers; the narrow, tubular corolla proceeds from a five-parted calyx, and ends in two lips, the upper having two erect, narrow lobes and the lower a broad three-cleft one, velvety scarlet; the five stamens are united in an erect tube. The cardinal flower is found in moist ground, especially along brooks, blooms in August and September, and is found from Nova Scotia to Minnesota and southward."[1]

"The cardinal, and the blood-red spots,
Its double in the stream;
As if some wounded eagle's breast,
Slow throbbing o'er the plain,
Had left its airy path impressed
In drops of scarlet rain."

As the season draws near to its close and the flowers grow fewer and rarer, they grow more and more individual, it seems, or else, because of their fewness, we make more of them. How much, for instance, the poet has made of the fringed gentian.

"Thou waitest late and comest alone,
When woods are bare and birds are flown,
And frosts and shortening days portend
The aged year is near his end."

Artists consider the blue of the gentian the nearest approach to the color of the sky. The leafy-angled and usually branching stalk is smooth and grooved, and grows annually from one to three feet high. There is something classical about the deep, vase-shaped corolla

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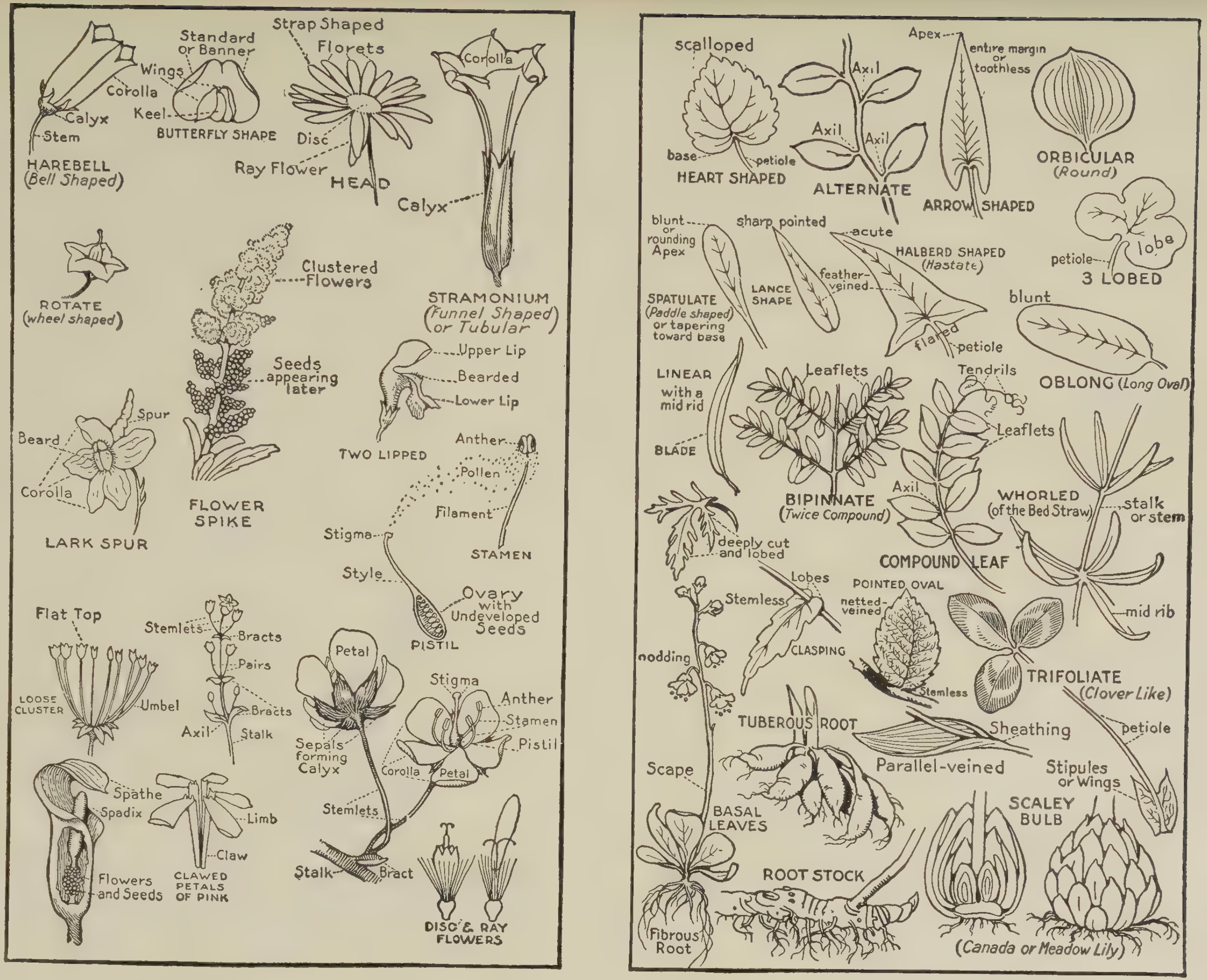
[1] Reed's "Flower Guide."



HOW TO FIND A FLOWER

At the left are flower forms; at the right, leaf and root forms. By studying these forms in the common plants of your neighborhood, you will soon acquire a valuable knowledge of plant construction.

of the erect, bright-blue flowers. The four rounded and spreading lobes are finely fringed around the top edge, and are sensitive to the sunlight. They open and close with a twisting gesture at night, or on dull days."[1]

The frosts are falling, and "the death of the flowers" has come. 'T is time to close the door and draw the curtains on the darkening out-of-doors. We have not gathered in all these trips your favorite flower, perhaps, nor named fourscore that should have had our care. But to name them all, or anywhere near all, was not our object; rather it was to take the path to the woods, to wander into the fields where they *are.* Once you get into the habit of field tramping you can be trusted to find the rarest of your plants and not to overlook "the humblest flower that blows."

The snows are flying, yet here is the witch-hazel spreading its yellow-flowered branches in the pale November light — the last of the race.

> Those few pale Autumn flowers!
> How beautiful they are!
> Than all that went before,
> Than all the Summer store,
> How lovelier far!
> And why? — They are the last —
>
> CAROLINE SOUTHEY.

SOME GOOD BOOKS

Wild Flowers Every Child Should Know, by F. W. Stack
The Book of Wild Flowers for Young People, published by G. P. Putnam's Sons
The Flower Finder, by Geo. L. Walton, M.D.
Wild Flowers, by Homer D. House
A Guide to the Wild Flowers, by Norman Taylor
Green Magic, the Story of the World of Plants, by Julie Closson Kenly
The Book of Wild Flowers, published by National Geographic Society
Flowers and Their Travels, by Frances Margaret Fox
The Wild Garden, by Margaret McKenny
Trees Every Child Should Know, by Julia E. Rogers
Familiar Trees and Their Leaves, by F. Schuyler Mathews
The Field Book of American Trees and Shrubs, by F. Schuyler Mathews
Trees: A Pictorial Volume for Lovers of Nature, by Thos. O. Sheckell
The Field Book of Common Ferns, by Herbert Durand
Our Northern Shrubs, by H. L. Keeler
A Primer of Forestry, by Gifford Pinchot

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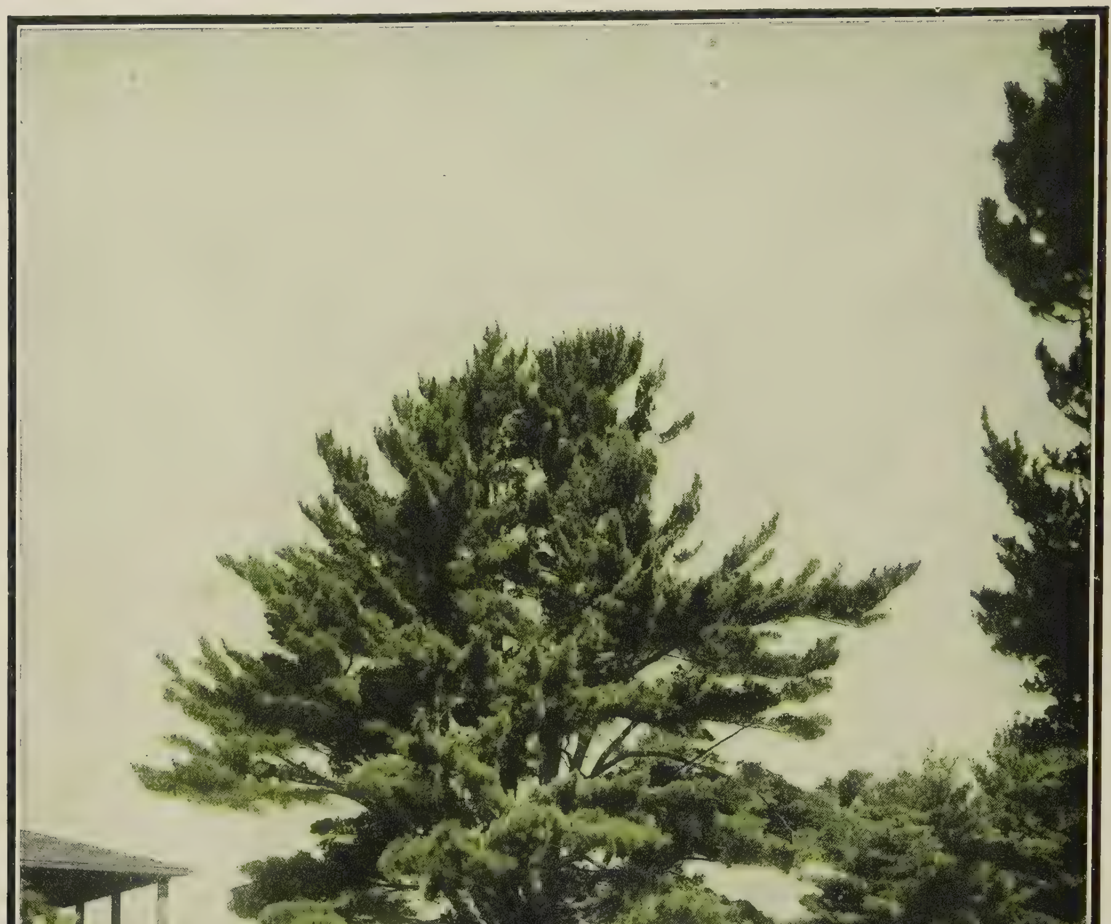
[1] "Wild Flowers Every Child Should Know."

L. W. Brownell

FRINGED GENTIAN



THE WHITE PINE (*Pinus strobus*)

One of our most valuable timber trees. In the forest the pine is crowded by its neighbors, and so grows straight upward, without any side branches.

THE "SEMINARY," A GROUP OF GRAY BIRCHES AT THE AUTHOR'S HOME, MULLEIN HILL

A FEW OF OUR NATIVE TREES

THIS is a very large world when you take it up to study — hundreds of flowers, hundreds of trees, thousands of animals and insects, and of the still humbler folk of vegetable and animal kinds tens of thousands of species more.

A book on the flowers can hardly close without a chapter on ferns, and one on mosses, and one on grasses, and one on algæ, and one on trees, and one on — But I must stop. Surely it is a big world and a full world, and a world brimming full of things to know. But all of these things cannot be contained in one book. Nor need you try or even wish to know all of these things. I have taken you afield with me enough times to make it plain to you how a knowledge of the out-of-doors may be obtained, and *what* knowledge it is that you should first obtain — that first of all which pertains to *your* neighborhood, to *your* out-of-doors.

Now it is not necessary for us to study the trees together as we have the flowers. The lesson of *how* and *what* was learned there. You need to know your common trees — you want to know them and you will.

For illustration: A college professor (who teaches literature too!) said to me recently that he did n't know an elm tree from an oak. Unthinkable, is n't it! On page 114 is shown an elm. Is there a single reader of this book who does not recognize the graceful rose-shaped form of this majestic and most beautifully shaped of American trees?

HOW TO GROUP THE TREES. THE PINES

Pines are *hard* and *soft* — two families. Under the soft pines (those with loose leaf bundles whose scaly sheaths drop off) there are two groups: (*a*) those that have five leaves to a bundle, and (*b*) those that have one to four in a bundle. Now under *b*, the second group, you have pines with four leaves to the bundle — *Pinus quadrifolia* (*quadri*, "four"; *folia*, "leaves"). Of those pines with two to three leaves to the bundle, there are those with slender leaves (*Pinus cembroides*) and those with stout leaves (*Pinus edulis*). Again you have pines with one leaf — *Pinus monophylla*, one of the Western nut pines, a food for the Indians.

It is a matter of leaves, and also of cones, in the larger groups. In the pine barrens of southern New Jersey, where I grew up, we had the Jersey pine, a lowly scrub tree that covers vast areas of waste land. It has *two* leaves in each bundle, like the red or Norway pine. This is one of the "hard" pines.

And here is the dark-green, fan-limbed white pine, prince of Eastern evergreens, as the sugar pine is prince of Western evergreens. When I was a boy, tall, wonderfully tall pitch pines waved over my grandfather's old farmhouse, and in their towering tops the winter winds sang to me their wild harmonies on the wild winter nights. Nowadays it is the white pines outside my windows that catch the winter winds and call back to memory the music of those sweet but solemn nights — for the sounds of the wind are solemn sounds, and the thoughts of youth are long, long thoughts.

Of the eighty well-established species of pines one half are American. Who knows and can remember forty different kinds of pines? No one — at least no one needs to. But what you do need to know is *how* to find them when you wish. Now that is largely a matter of needles — leaves — and the lesson on the pines will serve as an illustration of the *method* of tree study for the other families.

"Pines are cone bearers — so are larches, spruces, etc. But pines are distinguished from other genera of the family *Coniferæ* by bearing their needlelike leaves in *clusters* of one to five leaves, each of which is inclosed at its base by a sheath made of papery scales. No other conifer has this *sheath.* The *soft* pines, so called from their soft, light wood, shed their leaf sheaths as soon as the young leaves are fully developed. The pitch pines, so called because their heavy, dark-colored wood is full of resin, *retain the leaf sheath until the leaves are shed.*"[1]

OTHER EVERGREENS

Any study of the pines will soon lead you to all the other evergreens — the cedars (white and red), the spruces, firs, hemlocks, and junipers. One of the most ornamental, and by far the commonest evergreen in my neighborhood, is the savin or red cedar, whose tall, narrow-pointed spires rival in beauty of line the finest of tapering spires built by man. Its berries even are food for the cherry birds and the stray robins all through the winter.

While traveling the Western deserts, searching for animal life, we one day rode in an automobile for I should say a hundred miles through one of Oregon's forest reserves of noble sugar pines. Never was the quiet of a cathedral like the solemn and sweet silence that filled all the wide spaces among those kingly trees. It was one of the rare experiences of a whole life. I shall never have the balmy odor nor the deep religious and solemn awe of that great ride leave me entirely. A trip to sea, a journey into the vast prairies or sage deserts, a climb to the peak of some mighty mountain, a lone watching of the midnight stars, and a ride through the blue-stained light of a giant sugar-pine forest are experiences that I hope you all may know.

King of kings among all living things is the sequoia of the Pacific slope. Some day I shall go from Massachusetts to California first to see this oldest, mightiest, sublimest thing that lives. The redwoods reach a height of four hundred feet, and a *diameter* of twenty-eight feet, and show by their "rings" in their stumps that they have been alive for five thousand years! We have not the imagination even to *think* across this unthinkable span of life. There are two species of sequoia, the Big Tree — *Wellingtonia*, and the redwood, *sempervirens.*

I think the most impressive effect that I ever felt from trees, before my ride through the sugar-pine forests, came to me in the cypress swamps of Georgia — the gloom, gloom, gloom, with the funeral moss hanging like crape from the branches! It was in October, and autumn had already laid her dark hand on the deep savanna; but even the brightest summer day could not have shed any cheer into the shadowy depths among those cypress trees.

CHESTNUTS, OAKS, AND OTHERS

As I look out of my windows, besides the pines, I see three sorts of hickory trees, some young chestnuts, oaks, and a lovely group of white

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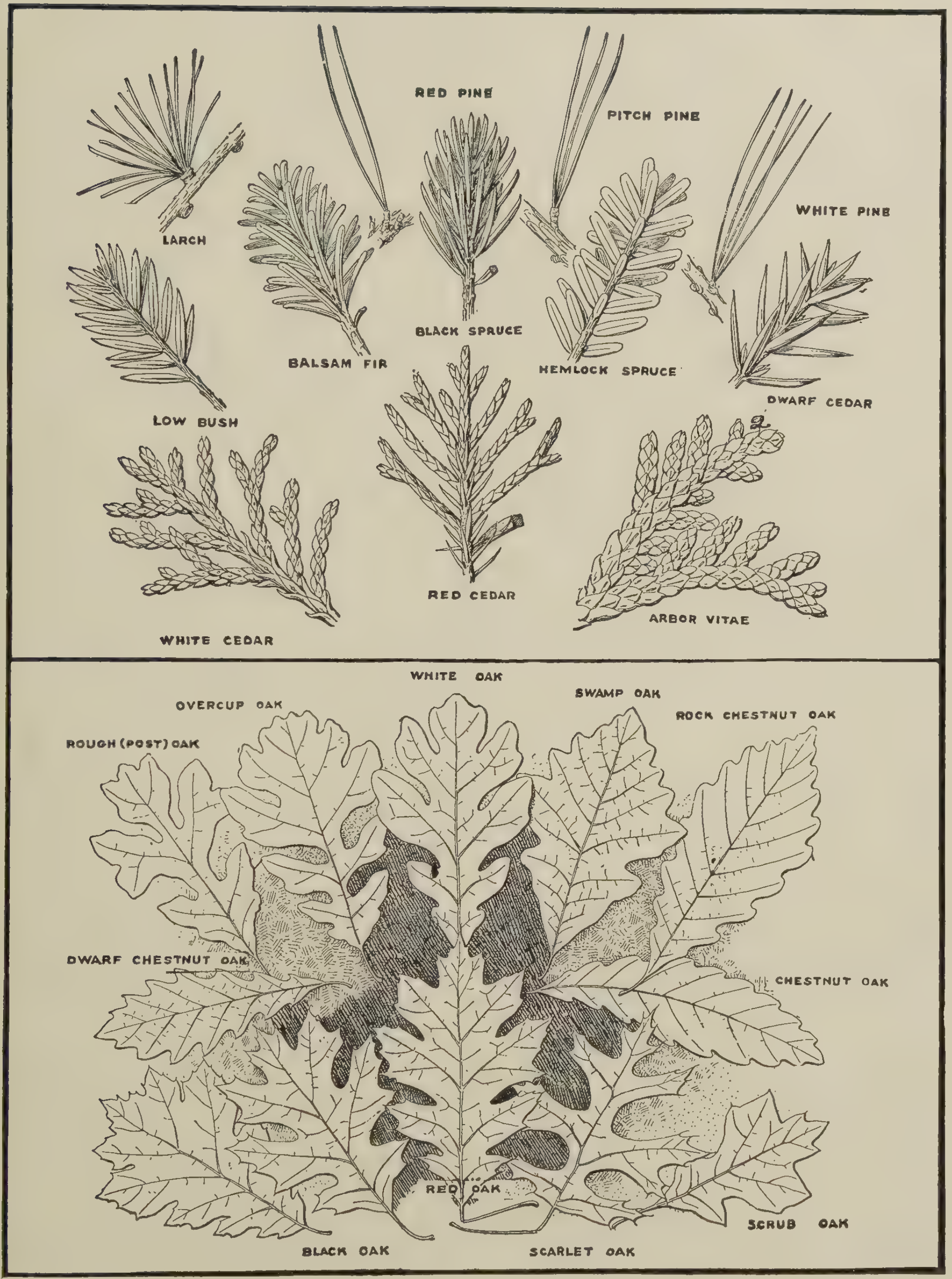
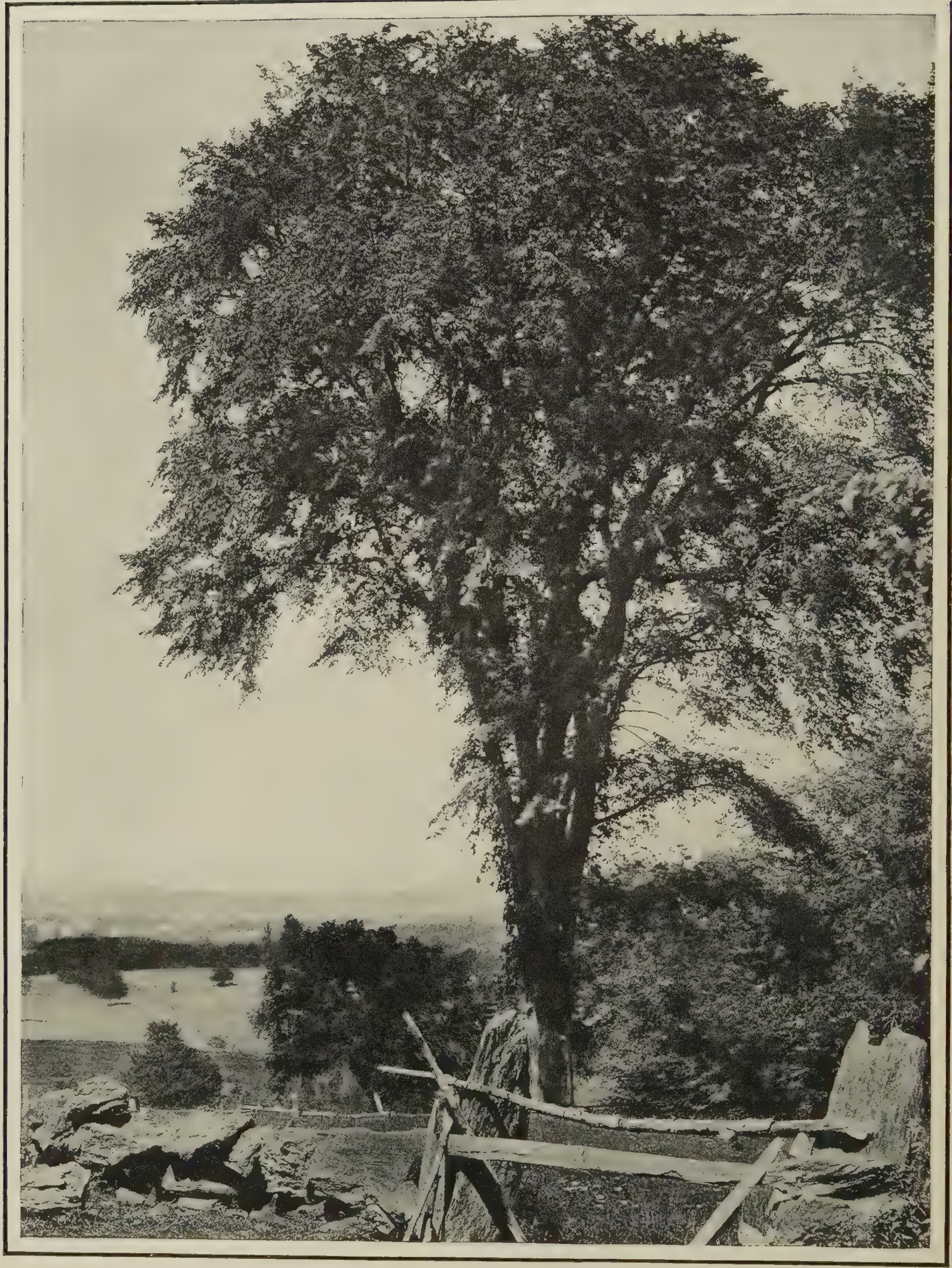
[1] "The Tree Book," by Julia E. Rogers.



TOP: LEAVES OF COMMON EASTERN EVERGREENS. BOTTOM: LEAVES OF AMERICAN OAKS



A FINE SPECIMEN OF THE AMERICAN ELM, BERKSHIRE HILLS birches, or small gray birch. (I have put in, on page 111, a picture of the birches, the "seminary" one of my poet friends calls the group, because "they look like girls in white frocks.")

Birches are among our most important trees, and the white or canoe birch and the ragged yellow birch are among the most beautiful of trees.

The hickories belong to the important group of nut trees, which includes the pecan, walnut, and shagbark. Those in sight from my windows are the shagbark (the hickory nut you buy in the stores), the thick-shelled pignut, and the large hickory nut.

The most valuable wood among all this nut family is the black walnut, noble specimens of which used to stand between the fields and at the turnings of all the lanes when I was a boy, but which have now disappeared owing to the high price offered for them — for furniture, gun stocks, etc.

Perhaps the most *beautiful* tree of the group is our mighty chestnut, whose sweet nuts all the world knows, and whose spreading top with its foam of creamy flower tassels makes the end of June like the May orchards for bloom.

Red oaks, white oaks, black oaks waved their branches to me from the hillside outdoors. The oak! Is it not your sign and symbol too of strength? There is one — a white oak — on my way to the station, that I should take my hat off to every time that I pass.

I know another, greater by far, in a wide river swamp where the old uncut forest still survives. It is a land of giants; huge green poplar and swamp white oak, so old that they have become solitary, their comrades having fallen one by one, or else, unable to loose the grip upon the soil that had widened and tightened through centuries, they have died standing.

Here stands an ancient swamp white oak, the greatest tree, I think, that I have ever seen. It is not the highest, nor the largest round, perhaps, but individually, spiritually, the greatest. Hoary, hollow, and broken limbed, his huge bole is encircled with the centuries, and in this green and grizzled top all the winds of heaven had sometime come.

One could worship in the presence of such a tree as easily as in the shadow of a vast cathedral.

"For it had bene an auncient tree,
Sacred with many a mysteree."

Indeed, what is there built with hands that has the dignity, the majesty, the divinity of life? And what life was here! Life whose beginnings lay so far back that I could no more reckon the years than I could count the atoms it had builded into this majestic form.

Looking down upon him from twice his height looms a tulip poplar, clean-boled for thirty feet and in the top all green and gold when the blossoms open. It is a resplendent thing beside the oak, yet how unmistakably the gnarled old monarch wears the crown. His girth more than balances the poplar's greater height, and as for blossoms, Nature knows the beauty of strength and inward majesty, and has pinned no boutonnière upon the oak.

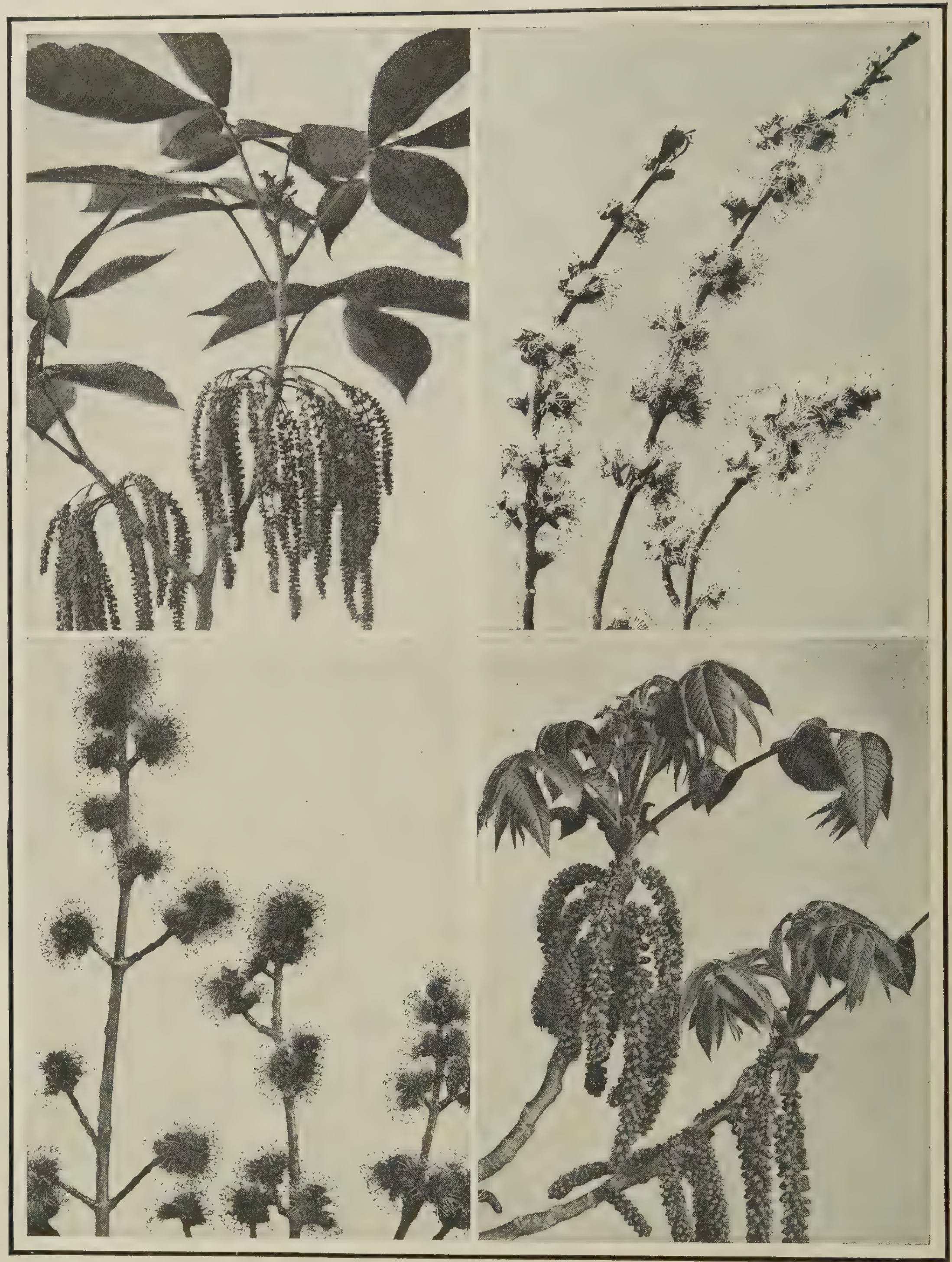
Along with the tulips, in columned and high-vaulted aisles, grow the tupelos, favorite "coon" and owl trees, whose great arms, like spanning rafters, where they join together, lift over your head the highest, most vaulted forest roof I know.

Over in my neighbor's yard stands one of the largest sassafras trees that I have ever come upon. It is on the edge of low ground, and protected as it has been for generations it has reached a stately height.

Another of Nature's splendid children is the great sycamore or buttonwood or plane tree. I am giving you a picture of one that is many years old, standing to this day in front of my mother's ancestral home near Hancock's Bridge, New Jersey. (See page 118.) The old Denn homestead was built in 1725, and no one knows the age of the old sycamore standing in the yard.

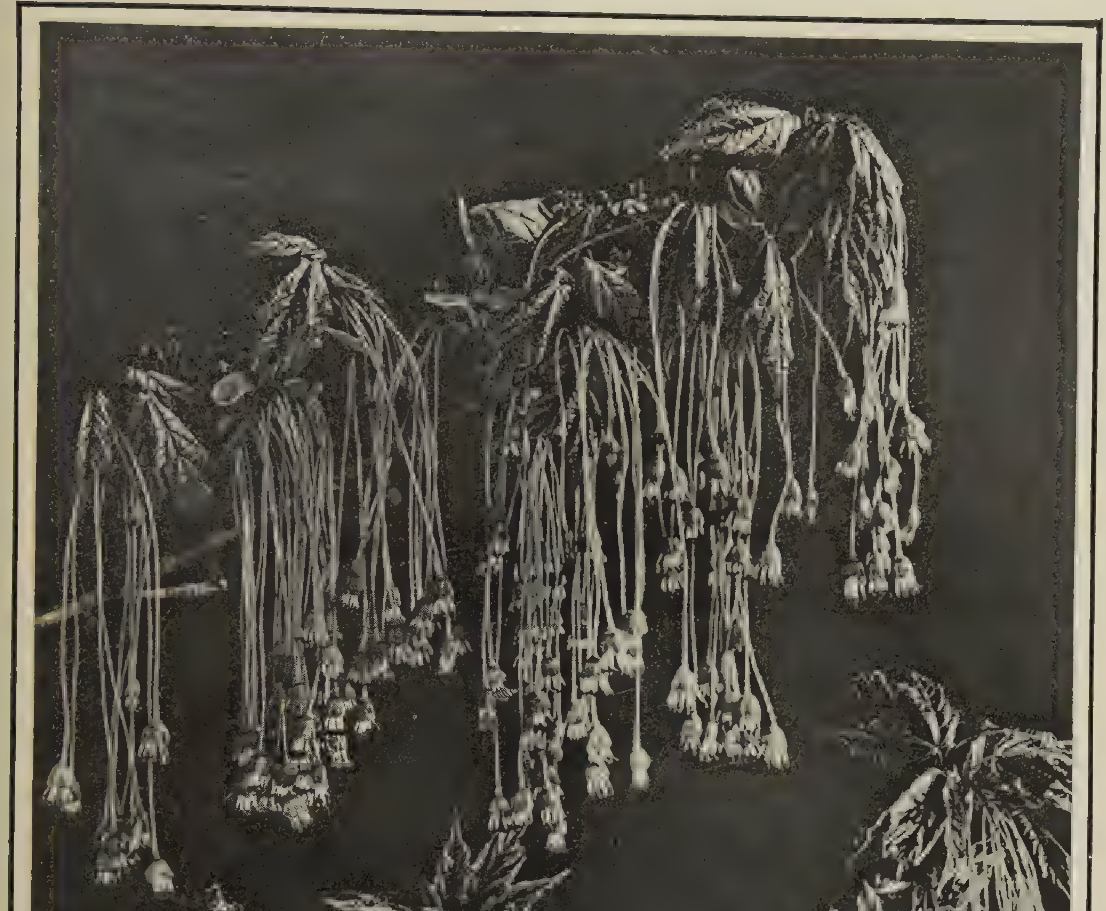
The red maple is first of my trees to bloom in the spring and its fruit the first of harvests to fall. No, not quite that, for away back in March the sugar maples sent me a gallon can of sirup from a "sugar bush" in Vermont — surely that was the first and sweetest harvest of the season. And what a splendid tree!

I have mentioned the shadbush among the flowers as my sure sign and open sesame of spring. Here is the "bush" grown into a tree along one of my Massachusetts roadsides. It looks almost like a fruit tree here, but the



FLOWERS OF COMMON TREES

Upper left: Hickory (*Carya alba*). Upper right: White maple (*Acer alba*). Lower left: Red maple (*Acer rubrum*). Lower right: Butternut (*Juglans cinera*).



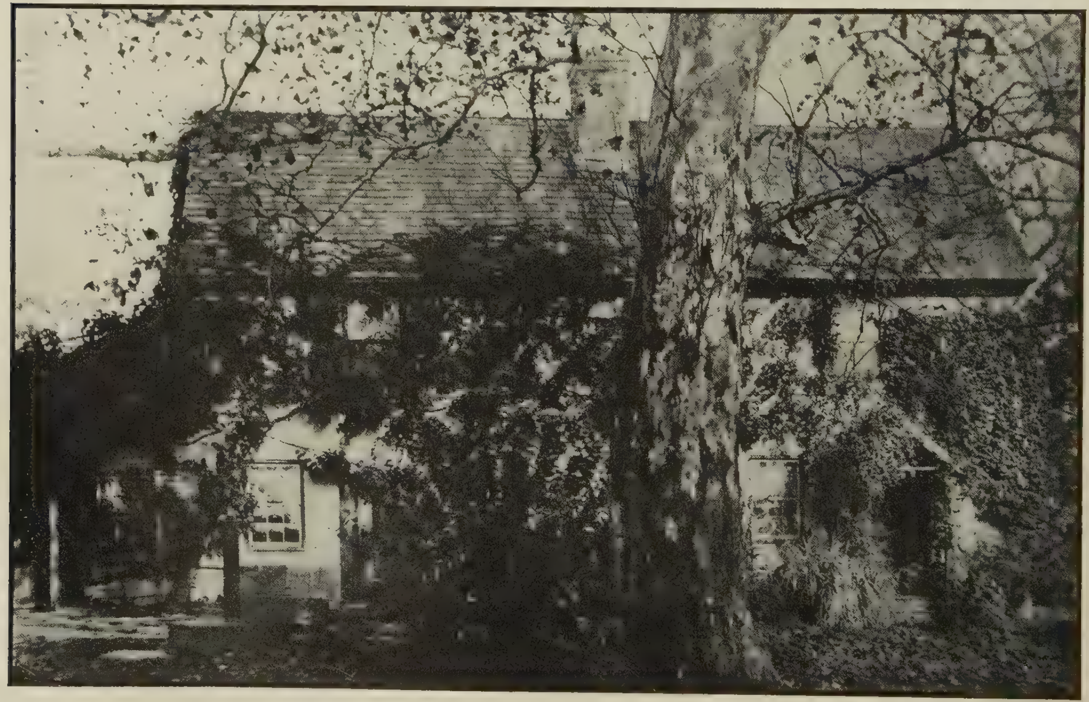
THE DROOPING YELLOWISH-GREEN FLOWERS OF THE SUGAR MAPLE (*Acer saccharum*) stone wall — think of a Jerseyman plucked up from his old worm fences and planted beside such a stone fence as this!

But to close this chapter let me go back to my boyhood for a glimpse of the slender swamp magnolia tree with its sweetest of sweet flowers, and say adieu with the persimmon upon whose sugary fruit I grew as if I were a young possum. Ah, but the apples of New England are full of comfort, you say. Yes, yes, but a boy who grows up on persimmons cannot be comforted in some seasons with apples or stayed with raisins.

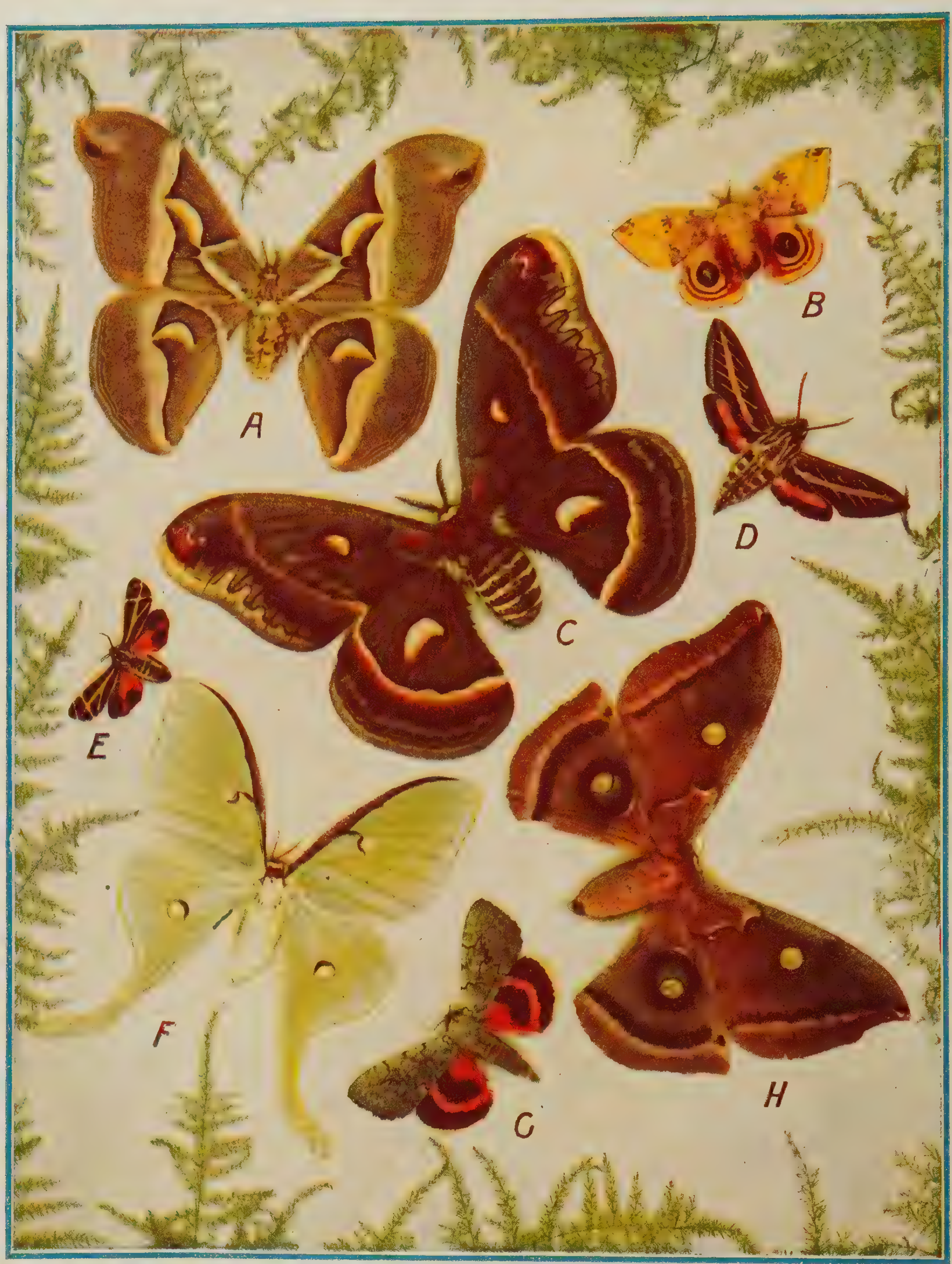
Do you know what a persimmon, picked from a particular tree along Cohansey Creek on Christmas day, tastes like, especially when you have not had a taste of those persimmons for twenty years? No, you do not — because you are not twenty years old, and because you were not a boy along Cohansey Creek, perhaps, and because, if you were, you did not know those two particular persimmon trees, maybe.

Nobody ever seemed to know the perfection of those persimmons, except myself and the possums. Not one of the Luptons, who owned the pasture, the pond, and the trees, had ever been a boy, so far as I could remember, and certainly not one of them had ever tasted the fruit of those two trees. There were other persimmon trees up and down the township; others here along the pond, but these two were the only trees to hold their fruit until Christmas, preserved with such richness of flavor, such gummy, candied, wild woodsy quality, that it could not decay. Those persimmons never decayed. They candied, evaporated, wrinkled, fell, and vanished away.

Or else the possums ate them — those that I did not eat. Of course they ate them. I don't know how many persimmons it takes to fatten a twelve-pound possum of October up to a twenty-pound possum for the Christmas dinner; but it must take more than one treeful of them. There is wonderful virtue in the sugar of the persimmons, but there is most wonderful virtue in the flavor of roast possum. "The trees of the Lord are full of sap," says the Bible, but the persimmon tree is also full of sugar and very often full of possums too.



GREAT SYCAMORE OR BUTTONWOOD TREE AT THE OLD DENN HOUSE, NEAR HANCOCK'S BRIDGE, N. J.



AMERICAN MOTHS

A. Ailanthus Silk Moth (*Philosamia cynthia*). *B*. Io (*Hyperchiria io*). *C*. Cecropia (*Samia cecropia*).
D. Morning Sphinx (*Deilephila lineata*). *E*. Tiger (*Apantesis vittata*, var. *phalerata*). *F*. Luna (*Actias luna*).
G. Sleepy Underwing (*Catocala concumbens*). *H*. Polyphemus (*Telea polyphemus*).

BUTTERFLIES, MOTHS, AND OTHER INSECTS

THE LIFE OF A BUTTERFLY

A SKETCH OF HIS LIFE

Aught unsavory or unclean
Hath my insect never seen;
But violets and bilberry bells,
Maple sap and daffodils,
Grass with green flag half-mast high,
Succory to match the sky,
Columbine with horn of honey,
Scented fern and agrimony,
Clover, catchfly, adder's-tongue,
And brier roses dwelt among.

EMERSON.

EVERYBODY knows a lion from a dandelion, but not everybody knows the name of just one moth or beetle or butterfly. Now there are a few things which live outdoors that everybody, every intelligent body, ought to know by name. There are hundreds of butterflies that I don't know and that you don't know; but I do know the milkweed or monarch butterfly, and so ought you.

The monarch is an American and found all over the continent as far north as Canada. He is four or five inches across, of bright orange, brown, and black, and is to be seen from May until late October, but is most easily found in July and August upon the milkweeds.

His life begins as a tiny but curious egg laid upon the leaf of the milkweed, which hatches into a tiny caterpillar with a skin that won't grow and so has to be burst through and left behind when the body gets too big for it. Children sometimes look like their parents, but this little larva (caterpillar) looks about as much like a butterfly as you do.

After a week of ravenous feeding it again outgrows its skin and comes out a strikingly marked worm with black, yellow, and green rings, as you see in the photograph (page 121).

Four or five times this molt takes place before the caterpillar is full grown.

"After the last of these larval molts," says Mr. Weed,[1] "the caterpillar feeds for a week or ten days. Then apparently the prodigious appetite it has shown throughout its life becomes satisfied, for the insect becomes restless and wanders about. It is searching for some sort of shelter where it may spend the quiet pupal period, when it will be utterly helpless to escape the attack of its many enemies. Having found a sheltered corner of a fence, or some similar situation, it proceeds to spin a silken web upon the under side of the chosen board, in which a little later it entangles its feet and hangs downward preparatory to becoming a chrysalis.

"In this position it remains for some hours — perhaps a day — the body juices gravitating

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[1] "Nature Biographies." By permission of Doubleday, Page & Co.

downward and causing a swelled appearance on the lower segments. Then the skin splits apart again, and it is wriggled off by the contortions of the body.

"When it finally drops away, there is left a strange-looking creature, broader below than above. This is a transition stage that lasts but a very short time; soon the form is entirely changed, so that the broadest part is above instead of below. The definite outline of the chrysalis is soon taken on, the outer tissues hardening into a distinct covering. The insect now looks like the picture of the chrysalis (page 123); in color it is a beautiful green with wonderful golden spots upon its surface, and a few black spots just below the black cremaster by which the chrysalis is connected with the web of silk upon the leaf.

"In this quiet chrysalis the insect remains for nearly a fortnight. Then the structure of the forthcoming butterfly begins to show through the thin outer covering, and you know that the period of the chrysalis is nearly ended. If you keep watch, you will probably see the sudden bursting of the outer envelope and the quick grasping of its surface by the legs of the newly emerged butterfly. Its wings at first are short and crumpled, bearing little resemblance to those of the fully developed butterfly. But as it hangs there with one pair of legs holding to the empty chrysalis and the other to the leaf above, the wings lengthen, hanging limply downward as the body juices penetrate the veins. A little later they expand in the other direction, the hind wings reaching full size before the front ones.

"Finally both pairs of wings are fully expanded, and the butterfly is likely to walk to the top of the support, where it rests for an hour or two while its tissues harden, before it attempts to fly."

POINTS FOR STUDY

That is the outline story of the monarch's life. But how little it really tells! Wonderful as is the change from grub to butterfly, still more wonderful are its ways of life that you can watch for yourself.

You see one flitting along and alighting for an instant upon a leaf of young milkweed; then it is off to another. Mark the leaf and look under it — a tiny milk-white egg, smaller than a mustard seed, glued to the under side of that leaf, an egg which under the microscope in your hand shows a sugar-loaf shape with beautiful markings.

How did she know that that weed was milkweed? She cannot see well for all her thousands of lenses in her compound eyes. She can smell marvelously well with her two noses at the ends of her antennæ (or feelers); but there were no flowers to smell on the plant. How did she know? Please study that question out for us.

Then she always chooses a milkweed, with one exception — the dogbane, a close relative. Try to find her egg on some other plant.

Then the monarch has been seen in vast flocks like swallows, sailing out to sea as if bound for Bermuda or South America — as perhaps they were. I want to see that sight some day, and so do you.

Then the flight of the creature! Did you ever see one in a gale of wind, holding its own above the summer tree tops? The monarch loves a blow, loves to spread her wide wings and conquer the elements in the air.

Oh, look at those wings under your microscope — see them, roofed as it were with shinglelike scales which give them color; find the scent pouch too on the upper surface of the hind wings of the male, and study what it may be for.

Watch to discover what birds eat the monarch. As a matter of fact it is extremely nauseous to birds, so that they let it alone — monarch indeed!

This fact has led to a most interesting case of what we call "protective coloration"; for another smaller butterfly, the viceroy, thrives because it looks so much like the monarch that, though sweet as a nut to the taste of birds, it is let severely alone. You can tell the difference between the two by the extra black cross bands on the viceroy's hind wings.

Don't kill the monarchs, for they are friends. But get Mr. Scudder's "Life of a Butterfly" and read it. Then in your cage place fresh milkweed leaves and raise by hand the caterpillar, and watch with your own eyes one of the most marvelous of Nature's magic works — the birth of a butterfly.

TWO CURIOUS TRICKS OF THE VICEROY CATERPILLAR

The butterfly is lovely; but the caterpillar is, too, when you come to think him lovely, in your mind, as you can when you really get acquainted with things and so get interested in them.

The butterfly that looks on the wing exactly like a smaller red brown monarch is the viceroy. Late in the summer you will find him sipping cider from the fallen apples under the trees. Besides knowing him by sight, there are two interesting things performed by the caterpillar that every Nature lover ought to see.

THE SWINGING PACKET

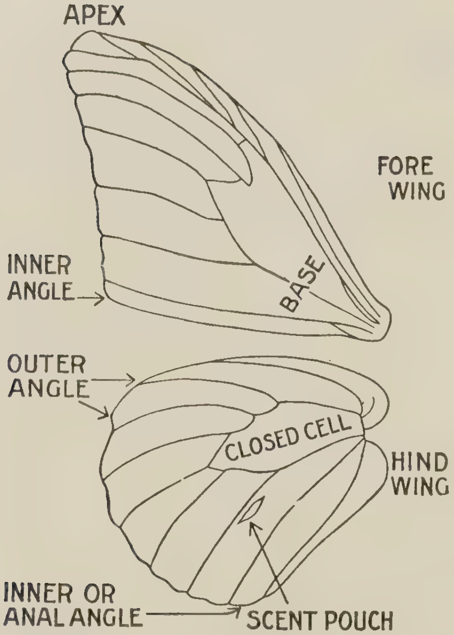
"Soon after birth," writes Mr. Scudder, "when it has eaten but a very few swaths down the leaf, the little fellow constructs a small and loose packet from minute bits of leaf and other rejectamenta, loosely fastened to one another and to the midrib, close to but scarcely touching the eaten edge of the leaf; and as fast as the leaf is eaten it removes this packet (continually added to until it becomes almost as big as a small pea) farther and farther down the midrib away from its perch, always keeping it near the eaten edge. It should be noted that it is so loosely attached (the bits of leaf at all possible angles) that it is moved by the least breath. Meanwhile the caterpillar has been growing larger and more conspicuous, and thus in greater peril from its enemies. There are two possible services that this odd packet may render.

"It should be remembered that the leaves preferred by these creatures as food are mostly such as are easily shaken by the wind, and as the caterpillar moves with the leaf and with all the surrounding leaves, in a continual fluttering in the case of the trembling aspen, and to a less degree in the other food plants, this of itself is a protection to it, as it would more readily escape observation as an object distinct from the leaves, all being in motion together; but on the more stable leaves, like the willow, the motion in a feeble wind would not be sufficient to be serviceable, and here, at least, the packet comes into play. *An object in motion among others at rest is a noticeable thing — a fact well recognized among animals*, as a host of them show when they fear being seen. This packet attached by loose silken threads moves, as stated, with a breath of wind, and so would *distract attention* from its architect near by, who has taken pains to place it at the farthest remove from his perch, while still (to avoid undesirable steps) on his daily track. If this be really its object, it is surely one of the oddest devices in Nature."

CATERPILLAR OF THE MONARCH BUTTERFLY FEEDING ON MILKWEED

THE VICEROY'S WINTER HOUSE

There are two broods of viceroys a year. Those that come to wing in August lay eggs



BUTTERFLY'S WING, SHOWING PARTS AND VEINING
Notice especially location of the scent pouch.

upon the willows and poplars, and it is these caterpillars that have the curious habit of building houses for the winter.

First, with wise forethought, being well aware through its natural instincts that the leaf which it has selected for its house, unless it takes measures to prevent it, will fall to the ground when the cold weather sets in, the larva fastens the stem of the leaf with silken cables securely to the twig from which it grows. It then gnaws off the blade of the leaf at its tip end, leaving little else but the midrib. Finally, it rolls the remaining part of the blade of the leaf into a cylinder, sewing the edges together with silk, leaving the under, rough side of the leaf for the outside of its house, and lining the smooth inside with soft silk. Here it swings till the yellow willow catkins are in bloom, when it comes out of its leaf den and goes to feeding, as if it were only last night that it went to sleep!

ANTIOPA OR MOURNING-CLOAK BUTTERFLY

The story of the monarch in general is the story of the life history of all the butterflies; yet, as in the case of the viceroy, each has its own peculiar history too, so that while you learn the large facts of life of the whole family through one, any one of them will pay you for study and watching.

One of the butterflies that everybody knows or should know is Vanessa antiopa, or the mourning cloak, as it is commonly called — a beautiful purple-black butterfly, having a cream-colored border along the outer margin of its wings. It flies leisurely about in the vicinity of woods and in the open fields in very early spring, even before the snow is off the ground.

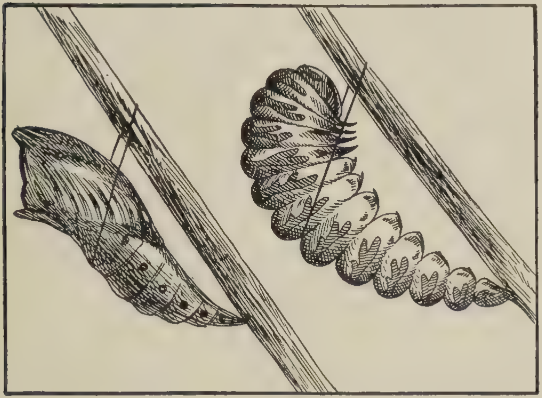
To me it is the most welcome of all the family, for long and cold as the winter may be I am sure to see Vanessa sucking sap out of the freshly cut tree stumps on a warm, sunny February day — a whole stump full of them, perhaps — and then I know that spring is close at hand.

Vanessa feeds upon the elm, willow, and poplar. It is a spiny, black caterpillar, and unlike the monarch *does* hibernate—living through the coldest winters in some sheltered spot in the woods. One of the most interesting things to know of Vanessa is that it is one of the most widely distributed insects in existence, found not only in North America, Bermuda, and Mexico, but all over northern Europe, and in Asia and Japan as well. It has a peculiar habit of "playing possum," making believe to be dead when taken in your hand.

THE BLACK SWALLOWTAIL OR ASTERIAS BUTTERFLY

Notice the thread in the picture on the next page, and the "lean" of the chrysalis. One of the interesting habits of this beautiful big black butterfly is the spinning of this silken loop by which to secure itself to its twig or post during the change from worm to butterfly, as a lineman with his strap and hook about his waist secures himself to his telegraph pole while fixing the wires.

The caterpillar, having become full grown, climbs up a stem, makes a little silken pad for its last pair of legs to stand on, rests some two hours, then begins by attaching a thread with its mouth to the stem about halfway



CATERPILLAR AND CHRYSALIS OF BLACK SWALLOWTAIL BUTTERFLY

down toward its tail. Then back and forth it weaves from side to side of the stem, throwing a long loop with its swinging head, which it catches in its second pair of legs until it has thus spun a loop of twenty-five or more strands. This done, by a quick dodge it ducks its head into this loop and lets it fall until it rests in the groove between two of the middle segments (rings) of the body. Then it leans back on it and goes to sleep, shedding this old worm-skin in twenty-four hours and becoming as you see it in the drawing.

You will know the caterpillar by its ground color of green, by its bands of black with yellow spots in them, by the disagreeable odor given out by its orange-colored horns, and finally by its feeding only upon the wild carrot, parsnip, fennel, parsley, or some member of the parsley family.

The black swallowtail is very common, and measures some three and one quarter inches across. You will know it by its black color, its yellow spots in double rows along the margins of its front wings and its hind wings with bright blue between the yellow rows, its red eyespot on the inner edge, and the slender tail half an inch long.

THE TIGER SWALLOWTAIL OR TURNUS BUTTERFLY

> A golden butterfly, upon whose wings
> There must be surely character'd strange things,
>
> . . . .
>
> Onward it flew, . . . then high it soar'd,
> And downward suddenly began to dip,
> As if, athirst with so much toil, 't would sip
> The crystal spout head; so it did, with touch
> Most delicate, as though afraid to smutch
> Even with mealy gold the waters clear.
>
> KEATS, *Endymion.*

Whereas the Asterias swallowtail was black, of course the tiger is yellow. The big yellow butterfly seen about the tree tops and marshes all summer is very likely to be the turnus or tiger swallowtail. The big-headed, dreadful-swelling caterpillar feeds on birch, poplar, and ash trees, wild cherry, shadbush, and many others. It makes a silk loop as does Asterias, only it lies down in it instead of leaning back up against it. The big, sunlit-yellow butterflies love the lilacs, where you can readily watch them.

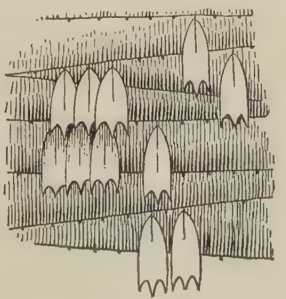
TROILUS OR GREEN-CLOUDED BUTTERFLY

Another big, glorious swallowtail to be early recognized is the Troilus or green-clouded. The large eyespots, big head, and bad-smelling, orange-colored horns of the caterpillar relate it to the tiger and Asterias. The butterfly is large, darkish-green, with two bright eyespots on the hind wings, and is found in its chrysalis usually upon or near the spicebush upon which the caterpillar feeds. It has no bright double row of yellow spots upon the wings as has Asterias.

If you want a delightful sketch of Troilus read the chapter in Gibson's "Sharp Eyes" about "The Spicebush Bugaboo."

THE PAINTED BEAUTY

Another common and exceedingly beautiful butterfly that you should come to know is the



MAGNIFIED SECTION OF BUTTERFLY WINGS, SHOWING ARRANGEMENT OF SCALES

Painted Beauty, whose caterpillar you will find on the large everlasting plant in the autumn fields. It is closely related to the Mourning Cloak, and hibernates as the Mourning Cloak does, but no one seems to know just where in the woods. Will you kindly find and report to us?

THE PAINTED LADY

But don't get the Painted Lady mixed up with the Beauty, for the Lady has *four* peacock eyespots on her hind wings in place of the *two* on the Beauty. Hunt for these two until you can place them side by side and know which is which. The Lady feeds on the thistle.

Still another near relative is the Red Admiral; it feeds on the nettle.

VANESSA OF THE PEAK

As has been said before, this volume is intended to be only a series of suggestions and a source of inspiration to you — something to get you out-of-doors and help you find your way about there. It does not pretend to be a complete butterfly book or frog book or bird book, for if it did then it would need to be strictly scientific and exhaustive and so treat of nothing but birds or beetles or butterflies.

It is not this or that, but the out-of-doors that is the theme of this volume. It is this great, glorious world of animals and plants and insects — great things and small things — all living things that you are interested in, as those things surround *you* and make up the world in which you live — that we are studying.

As your guide I have not left you without suggestions for books upon butterflies, books sufficient for all your study. But I wish to do more than that; more even than to tell you, as I have already, the few butterflies that you ought to know. I wish rather to give you something of my own butterfly experience, a bit of my own feeling, a little of my own knowledge of butterflies, in order to show you what place in my world the butterflies have and how they enter into my life.

Some seven thousand feet or more up Mt. Hood in Oregon we came to "Tie-up Rock" — the place on the climb where the glacier snows lay before us and we were tied up to one another and all of us fastened by rope to the guide.

By William L. Finley

ELEVEN THOUSAND FEET INTO HEAVEN, ON MT. HOOD, WHERE THE LITTLE BUTTERFLIES WERE PLAYING

Author is second from top, next to the guide.

From this point to the peak, more than eleven thousand feet up, it was sheer deep snow. For the last fifteen hundred feet we clung to a rope that was anchored on the edge of the crater at the summit.

Once we had gained the peak we lay down behind a pile of sulphurous rock, out of the way of the cutting wind, and watched the steam float up from the crater, with the widest world in view that I ever turned my eyes upon.

The draft pulled hard about the openings among the rock piles, but hardest of all up a flue or chimney that was left in the edge of the crater rim when parts of rock fell away.

We lay at the side of this flue and soon discovered that butterflies were hovering about us; no, not hovering, but flying swiftly up between the rocks from somewhere down the chimney or flue.

Then I got up to investigate and found that a host of butterflies (*Vanessa californica*) were *playing* over the peak of one of the highest snow-capped mountains in America. They were flying across the peak, then down over the crater until the wind that drew up the flue caught them and whirled them, to their evident delight, up and out over the peak, when they again took their wings, as boys take their sleds, and cut across till they got caught again in the fierce upward draft that bore them whirling over Mt. Hood's pointed peak.

Here they were thousands of feet above the snow line, where there was no sign of vegetation, where sulphurous gases made the air smell, where the very next day a wild snowstorm wrapped its frozen folds about the peak — here they were, butterflies, playing, a host of them, like so many schoolboys in the first sliding snow!

SOME OF THE MOTHS YOU OUGHT TO KNOW

WHAT the butterflies are to the day the moths are to the night, for one of the characteristics of the moth family is the night flying of most of them. When

> "The winds are wist and the owl is still
> The bat in the shelvy rock is hid,"

go out for the butterflies; but for moths you will wait until the twilight falls and the bats come out, and the whip-poor-wills begin their night-long calling.

In the blinding sunlight on the snowy peak of Mt. Hood I found the little Vanessa butterflies playing on the wind; so down in the deepest, darkest midnight swamp you will find great wide-winged moths of marvelous colors flapping softly through the gloom.

There are flowers that open by day and others that open only at night. The day flowers have their insect friends; so do the night flowers have theirs. If you will watch by the honeysuckles, or the trumpet creeper, or the big, rank flowers of the Jimson weed in the dusk, you will see the shadowy, whirring wings of some large insect hovering over the long tubes; and looking closer you will see the creature's tongue like the long bill of a humming bird reaching into the honey depths of the blossoms. The flying visitor is one of the moths, one of the sphinx or hawk moths perhaps, as many of the other large moths do not eat at all after the caterpillar stage.

They are not only gatherers of sweets, but they are also pollen bearers, carrying the life-giving dust from flower to flower, as bees do in the clover and cucumber fields; and so dependent are several of the long-tubed or spurred flowers upon the night-flying moths for the fertilizing of their seeds that they would perish from the fields without them.

These flowers with long tubes have nectar at their bases, and pollen sacks so placed that they must come into contact with the moth's head or eyes when his proboscis or tongue is pushed to their depths. You will find a most interesting account of this dependent relationship in William Hamilton Gibson's "My Studio Neighbors" (pages 171–224).

THE DIFFERENCE BETWEEN MOTHS AND BUTTERFLIES

> There be Insects with little *hornes* proaking out before their eyes, but weak and tender they be, and good for nothing; as the Butterflies. — PLINY (Philemon Holland's Translation).

Most people think there are toadstools and mushrooms — two *different* kinds of plants; and most people think of butterflies and moths as butterflies only. Now toadstools and mushrooms are two names for one thing — but moths and butterflies are two names for two things. They both belong to the order Lepidoptera (Lep′-i-dop′-ter-a), that is, the *scale*-winged insects (look at the wings with your pocket microscope); but the moths (1) mostly fly at night; (2) they have feathered antennæ, never threadlike and knobbed on the end like the butterflies; (3) they have *stout*, hairy bodies; (4) they do not fold their wings above the back when resting; (5) the chrysalis is never naked or angular, but rounded and protected by a covering — generally a cocoon — though some caterpillars burrow underground, letting the earth take the place of cocoon.

But the best field marks of the moths are the night-flying habits, the feathered antennæ, and the position of the wings when at rest, which are either spread or folded against the body.

CATERPILLARS OF BROWNTAIL MOTH CRAWLING UP A TREE

The shaded portion of the trunk is black with the pests.

A GROUP OF MOTH PESTS

It is not scientific but it is perfectly natural to group things, as you think of them, according as to how they are related to you. And you come to have very pronounced feelings for things where they are so closely related to you as the moths are. No family group in all the animal world is causing me so much trouble as the moths.

Early in the summer the tent-moth caterpillars swept like a fearful fire from the skeleton branches of the wild cherry into my apple trees, then over the grass into the shade and hillside trees, climbing the stone walls, wiggling up every path, scaling the sides of the house in untold numbers to leave their dusty whitish cocoons over the grass, over the fences, outside and inside the house itself.

I shall lose some of my precious old orchard trees on account of them, — to say nothing of all my apple crop this year — and the ghostly, leprous look of all the orchard until cleaned of their nasty webs! That is the work of *one* moth — the tent caterpillar.

THE BROWNTAIL

Worse than the tent caterpillar is the wretched browntail, blighting every branch it touches, and with its fine, prickling hairs poisoning the skin, as you work among them, with a fiery itch that burns as burns the rash of poison ivy or sumach. All winter long, whenever chance offered, I was out with a long-handled tree trimmer cutting off the cocoons or nest webs of the browntail that dangled full of live young caterpillars from the tips of my apple and white-oak twigs.

THE GYPSY

But worse than either of the other two is the terrible gypsy moth, brought over here and allowed some years ago to escape. To-night (July 21) the oaks and pines all around my house are bare because of them. All over each tree are the long, hairy caterpillars and bunches of cocoons up and down the tree trunks at the base of the branches, and already the white moths are hatching and laying the big yellow patches of eggs for the next year's destruction.

THE CODDLING MOTH, AND OTHERS

But these terrible and triumphant three are not all. Yesterday all the clothes — winter overcoats, etc. — were brought out into the yard, hung on the line, brushed, sunned, and repacked in camphor — at great labor. Why? Because of a mean little moth (the clothes moth), so small that he runs over your garments and into the folds almost before you can see him.

And there is the apple coddling moth that destroys more of my apples yearly than all the family eat. Then there is the wax moth that over and over again has got into my beehives, tunneled through the combs, and destroyed the whole bee colony.

Then — but there is hardly any end to this group of moth terrors, for that is the way I think of them and group them, though they represent several of the ten moth families.

THE SILK MAKERS

Not all the moths, however, are of this destructive nature. Among the most useful of all the animals that man has learned to adapt to his needs is a moth — the Chinese silk moth.

There are several small silk-moth "farms" in this country, and I recall a time when all the people in my neighborhood began planting mulberry trees with the idea of raising the caterpillars and making silk; but the venture has never yet succeeded in the United States because it costs too much to unwind the long, fine thread of silk from the cocoons. Labor is not so high-priced in China.

But the life of the silkworm is interesting and will serve as an outline for the life of all of its family.

The eggs hatch in the spring, the young caterpillars feeding upon the mulberry leaves for about six weeks, when they reach maturity and begin to spin their golden-yellow or white cocoons. Each cocoon is made of a continuous thread from four to nine hundred feet long and of rich luster.

Inside this silken house sleeps the chrysalis for three weeks, when the moth breaks open its skin, secretes the bombycid acid which dissolves the gummy mortar of the cocoon, loosens up the threads, and, through a round hole in the top, comes out a small cream-white moth, with broadly feathered antennæ. So long has it been reared in captivity that it has quite lost the power of flight.

Underwood & Underwood

CECROPIA CATERPILLAR

Silk manufacture is one of the three great textile industries of the world, and every thread of the silk mills, whether in China, Japan, France, Italy, or the United States, is first spun by a *moth.*

OUR NATIVE SILK MAKERS

The best known of our native silk makers is the great Cecropia moth (Ce-cro′-pi-a), whose immense brown cocoons you will find in the fall and winter attached to bushes, shade trees, fences — almost anywhere, as necessity or chance happened to order.

This is the best of all the native moths for your study. Cecropia spins this huge cocoon out in the open where you can watch its process. It is a double-walled affair too, hence very elaborate, and very instructive to watch. The caterpillar is large, brilliantly colored, hearty, easily kept in captivity, and a steady, skillful worker. He is twenty-four hours spinning his cocoon, spinning altogether a vast number of yards of thread, but the threads sticking so tight together as they touch in the spinning that it is not easy to unwind the silk.

Cecropia is among the most gorgeous of all moths, sometimes having an expanse of wing of six and one half inches, the whole creature a wonderful blend of red and white against a background of rich dusky-brown.

The only way to learn the difference between the markings of Cecropia, Promethea (Pro-me′-the-a), Cynthia (Cyn′-thi-a), and Polyphemus (Poly-phe′-mus) — our four most splendid moths in yellows, reds, whites, and browns — is to study them carefully side by side.

POLYPHEMUS

It is Polyphemus, however, that is called the American silkworm, for his thick whitish cocoons, built without openings and wrapped in a leaf, are made of a continuous thread of silk some eight hundred feet in length, that can be easily unwound.

The cocoon of Polyphemus falls to the ground when the leaf in which it is rolled lets go in the autumn; so look for them under the trees — hard, white, leaf-rolled, and about one and one half inches long. The thick, deeply segmented caterpillar is of a leaf-green color, with rows of orange tubercles and seven slender, oblique yellow stripes on the first abdominal segments of its body. Whereas the longer tubercles on Cecropia are blue on the sides and yellow along the back, with four large red ones near the head.

Not so gorgeous, but even more enchantingly colored, is Luna — the large green moth with long, streaming swallowtails. If Cecropia is colored with pigments from the sun, then Luna, as its name implies, is painted with the dyes of the moon. So large, so delicate in texture and color, the wings of Luna, when you come upon them in the woods, opened wide against some tree trunk, or flitting waveringly through the gloom, seem almost ghostly and not of our world — as if they came down on the moonbeams and found themselves unable to fly back.

There are two others of this giant silkworm group that give to our out-of-doors the touch of the tropics. One of these two is Promethea, whose brown cocoon, smaller than Cecropia and cut open at the end like it, you will find securely fastened to the twigs by silk so that it cannot fall, as Polyphemus falls when the leaves drop. You will often find it upon the twigs of barberry, blackberry, sassafras, and other shrubs and trees.

"The cocoon," says Mr. Weed, "is of special interest because it shows a remarkable instinct on the part of the caterpillar that constructed it. If you examine the structure of the cocoon carefully, you see that a leaf forms the framework on which the silken web was spun. Sometimes the leaf may have disappeared, but the impression of its midrib and principal veins is easily seen. Notice how cleverly it is attached to the twig by silken threads woven tightly around it.

"By keeping the Promethea cocoons under observation late in spring or early in summer, you may be able to see the moths develop. Sometimes, however, you may get only a four-winged parasite for your pains."

The other of the two is Io or the bull's-eye moth, the least of giants, measuring hardly more than three inches from tip to tip, but lacking nothing in color — especially in the hind wings with their brilliant reds, yellows, blacks, and blues and their great eyespots at the centers.

THE SPHINX MOTHS OR HAWK MOTHS

Next to the giant silkworm moths come the sphinx moths for size and beauty. There are at least six members of this family that the well-versed Nature student ought to know at sight. The first and most familiar is the five-spotted or tomato sphinx; then the Pandorus sphinx, a caterpillar of which I picked from my grapevine this morning; the twin-spotted, that feeds on the elm, willow, oak, and apple leaves; the "hog" caterpillar of the vine (*Everyx myron*); and the purslane or white-lined sphinx moth, that feeds on purslane and upon Virginia creeper and other vines that are host to the "hog." The sixth member is the humming-bird moth.

The sphinx family numbers some hundred

members in the United States, and of the family as a whole, says Comstock:

"Of all the beautifully arrayed Lepidoptera (scale-winged) some of the hawk moths are the most truly elegant. There is a high-bred, tailor-made air about their clear-cut wings, their closely fitted scales, and their quiet but exquisite colors. The harmony of the combined hues of olive and tan, ocher and brown, black and yellow, and grays of every conceivable shade, with touches here and there of rose color, is a perpetual joy to the artistic eye. They seldom have vivid colors, except touches of yellow or pink on the abdomen or hind wings, as if their fastidious taste allowed petticoats only of brilliant colors always to be worn beneath quiet-toned over-dresses." (Get his "Manual for the Study of Insects.")

And Mary C. Dickerson, in her charming book "Moths and Butterflies" (a good book to have, by the way), thus describes the characteristics of the family in describing those of the tomato sphinx:

"The moth has a stout and hairy body. There is great beauty and harmony in the coloring of its wings. It flies at dusk. It has long, narrow wings and is most powerful in flight, for which characteristic it has received the name of hawk moth. Its proboscis is remarkably developed, and, as the moth poises on vibrating wings before the honeysuckles to get the nectar from their deep flowers, we can understand why it has been named humming-bird moth. The antennæ are thickened at the middle, and the tip is curved backward to form a slight hook. The larva is long and cylindrical and has a horn at the hind end of the body. When disturbed it takes the noted 'sphinx attitude.' The chrysalis is formed underground."

Among other moth *families* that you will come to know will be the loopers or "measuring worms"; the owlets (a bad lot!), which include the cutworms, the army worms, the bollworms and the cotton worms, and the beautiful "underwings"; the tussocks (the gypsy moth is a tussock); the leaf rollers, and the leaf miners.

Here is a fascinating field for study that is now engaging the whole attention of many of the greatest of our entomologists. Were I a boy again with my work to choose, I cannot think of a field that offers larger chances for experiment, usefulness, and fame than the study of insects, and especially the moths.

SOME INTERESTING ITEMS FOR OBSERVATION AND STUDY

IN THE ARCTIC COLD

FRAIL, fragile as a cobweb, with wings like painted gauze, that fill before the winds like the sails of phantom ships, what could look less hardy and capable of withstanding the extremes of weather than these children of the sun — the butterflies? Yet to the ends of the earth they go, over the tops of the loftiest snow-covered peaks; to the burning deserts; to the deep, dark bottoms of the steaming tropical swamps. I have given you an account of the butterflies on the smoking summit of Mt. Hood, over whose pointed peak a wild snowstorm swept the day after my descent. Then, too, there is the White Mountain butterfly, whose life is spent at the snow line in the White Mountains, where a colony of them has existed probably ever since the glacial period, upon the loftiest summit of Mt. Washington, in New Hampshire.

SIR JOHN ROSS'S ARCTIC MOTHS

Here is an account of arctic moths taken from the "Narrative" of Sir John Ross's second voyage to the arctic regions. The specimens upon which the observations were made were the caterpillars of *Laria rossi*, a moth which is found abundantly in the arctic regions of North America.

"About thirty of the caterpillars were put into a box in the middle of September, and after being exposed to the severe winter temperature of the next three months, they were brought into a warm cabin, where, in less than two hours, every one of them returned to life, and continued for a whole day walking about; they were again exposed to the air at a temperature of about forty degrees below zero, and became immediately hard-frozen; in this state they remained a week, and on being brought again into the cabin, only twenty-three came

MOTH RESTING ON CECROPIA COCOON

to life; these were, at the end of four hours, put out once more into the air and again hard-frozen; after another week they were again brought in, when only eleven were restored to life; a fourth time they were exposed to the winter temperature; and only two returned to life on being again brought into the cabin; these two survived the winter, and in May an imperfect Laria was produced from one, and six flies from the other."

SCENT BAGS AND PROTECTIVE GLANDS

Many butterflies are provided with scent scales on their wings, evidently to attract one another in the mating season.

Others have protective glands or powers of secreting strong acrid juices (the milkweed butterflies), due perhaps to the plants upon which they feed, that makes them distasteful to their enemies.

THE MIGRANTS

Some of this same family are also migrants like the birds. The monarch, for example, has crossed the Pacific on vessels and is often found in great numbers far out at sea; and it sometimes appears in great swarms on the eastern and southern coasts of New Jersey in late autumn.

MIMICRY

Protective mimicry is common among the moths and butterflies. In animals it may be the simulation in form or color, or both, of natural objects; or it may be the aping of form and color of another animal, which is not attacked by enemies which prey upon it. Of course this mimicry is unconscious and is the result of a slow process of development which has no doubt gone on for ages.

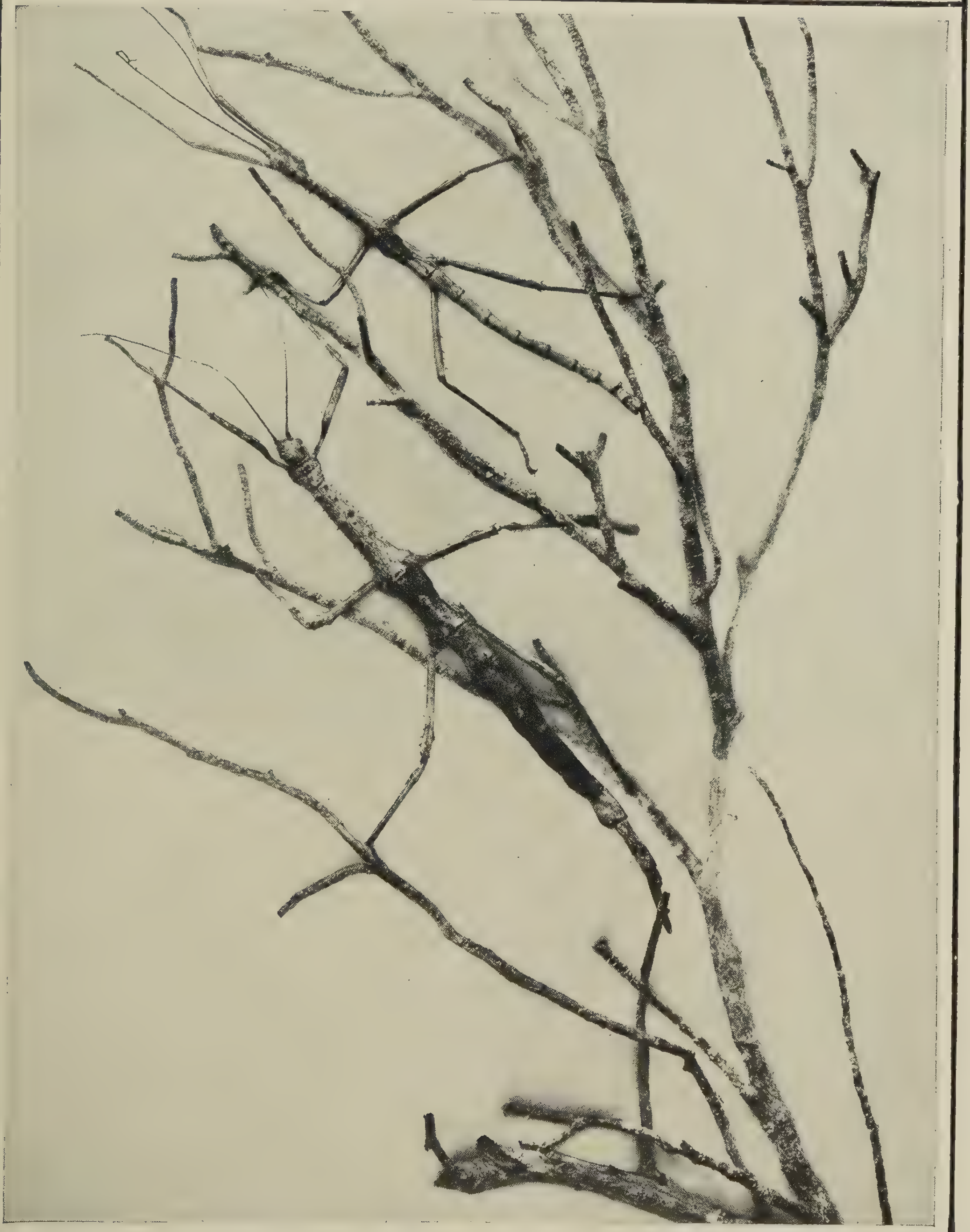
The "walking sticks," creatures which resemble the twigs of trees; the "leaf insects," which look like the foliage of plants; the "leaf butterfly" of India, in which the form and the color and even the venation of leaves are mimicked, are familiar illustrations.

Repulsive objects are frequently mimicked, as in the case of one kind of spider which escapes its foes by resembling a patch of bird lime. The resemblance is so exact as to deceive the most sagacious, and the discovery of the creature was due to the fact that the naturalist who happened to see it observed, to his surprise, that what he was positive was a mass of ordure moved!

Among the moths this strange thing is seen in the wonderful manner of their matching the thing upon which they settle. You will often fail to see the creature because of its perfect blending with its surroundings.

PROMETHEA MOTH

HOW NATURE PROTECTS ITSELF. FIND THE INSECTS



Courtesy of Boston Society of Natural History

WALKING STICKS FROM TORTUGAS ISLANDS, FLORIDA

Good examples of protective mimicry. In this case the insect resembles the twigs it lives among.

BEE CULTURE IN CANADA

Manitoba is proving itself as a province well adapted to bee culture. An apiarist is shown here carefully watching a swarm.

SOME OTHER INSECTS

As you will see, I am confining this part of the book almost wholly to moths and butterflies because of our great interest in them for their beauty. But from a hundred other points of view the bees, ants, wasps, beetles, and ichneumons are quite as important and interesting.

Take, for instance, the life history of the honeybee, and the work it does. Yesterday I took sixty-four pounds of driven white honey out of one of my hives, all of it made between August 7 and September 4 from the sweet pepper bush or clethra. Isn't such a creature worth knowing?

And every spring and fall a man who grows cucumbers in a hothouse comes to me for several hives of bees to put into the hothouse in order that the bees may carry the pollen from one blossom to another — else he would not get a single cucumber! All of the fertilizing of these and myriads of other plants depend upon the bees or insects of some other kind.

"The one great ambition in the lives of the flowers," says a recent writer in "Flowers," "is to perfect their fruits and seeds for reproduction. This is brought about through the activity of their pollen. Now pollen, according to natural law, must be transferred at the proper time from the anthers of the staminate, or fertilizing part of the flower, to the stigma or style of the pistillate, or seed-bearing part. Sometimes these important parts or features are incorporated and perfected in the same flower, and again they occur in different flowers, either of which is borne on the same plant or on separate plants of the same species.

"When the stamen and pistil combination is formed in the same flower, the transfer of pollen may be enacted therein, and is called self-fertilization; but where they occur in separate flowers, the process of pollination must depend upon other, or outside influences or assistance, and is called cross-fertilization. The transfer of the vitalizing pollen is an exceedingly important matter with the flowers. Their wonderful and varied construction and formation, simple or complicated, as the case may be, is in itself a means indicating the nature of its method or methods wholly directed toward the very necessary fertilization or cross-fertilization.

"Some flowers are so constructed that they can accomplish the desired result by themselves, and many and varied are the means by which the fertility is brought about. Others, again, must depend upon entirely different means for distributing the wonderful vitalizing pollen. Sometimes they must depend upon the winds and rains. Also, many species are so ingeniously constructed that the necessary transfer, or scattering, of the golden grains is performed automatically, as the flowers mature.

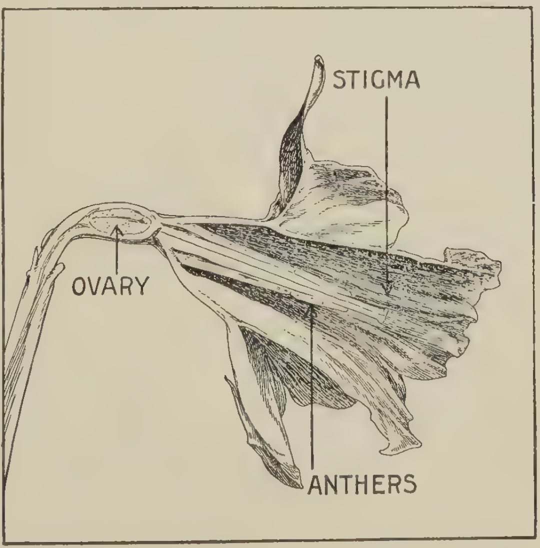
"So much for the why and wherefore in connection with the preparation and production of the healthy germinating seed. But why the many beautiful colorations, markings, fragrance, nectar, and peculiarity of construction or formation of the flowers? Why all this unlimited variation ingenuity in floral effect and effort? Is it not a fundamental principle, to attract the bees and other nectar-seeking insects?

"Some years ago, an attempt was made to introduce our common red clover into Australia. A quantity was planted, and responded with a vigorousness of growth that was surprising. The seed product was a failure. Investigation resulted in the introduction of a number of our common and familiar big bumblebees, whose liberation among the clover blooms of the next planting resulted in perfecting the production of seeds. The bumblebee was the direct means of transferring the pollen from flower to flower. In this way the honeybee assists materially in the fertilizing and cross-fertilizing of the flowers. The bee is seeking the tiny drop of nectar secreted within the flower, and is attracted to it by the sense of sight and smell."

The life of the honeybee is intensely interesting, but only the barest sketch has been attempted here. The tiny egg at the bottom of the wax cell hatches into a grub, and in a few days the young bees are out ready to help inside the hive with the housekeeping — that is, if they are females or "workers"; if males or "drones," they are big feeders only and no use at all. If the honey flow is on, the young bee will probably work herself to death in six weeks — literally wearing out her wings in the exciting labor of storing honey. But every day the old queen mother (only one to a colony) is laying hundreds of eggs and the swarm keeps up its numbers in spite of fearful loss through a variety of enemies and accidents. The younger bees hatched in the fall live with the queen all winter and are ready to bring in pollen to feed the hatching brood in the spring as soon as the weather permits them to fly. The queen can lay either "drone," that is, male eggs, or "worker," that is, female eggs, as she pleases, putting each kind in the special-sized cell prepared for it.

THE WASP

The wasp family is as wonderful for instinct as the bees. You know them — the two groups



SECTIONAL VIEW OF A FLOWER, SHOWING PARTS INVOLVED IN FERTILIZATION BY THE BEE of them even; that is, the solitary, those living alone, and the social wasps, those living in communities. You will wish to read the charming book on the wasp by George W. and Elizabeth G. Peckham, and Sir John Lubbock's "Ants, Bees, and Wasps."

Here is Nature-study material right at hand, in your attic, where the mud wasps build.

"Nothing can be more fascinating than the study of the habits of the solitary wasps. The social wasps form communities and live in nests, usually constructed of a paperlike substance, and lead very much the same socialistic life as social bees. The solitary wasps, in the main, form burrows, just as do the solitary bees, construct cells within their burrows and in the cells provide food for their larvæ. This food, however, is not the pollen and honey mixture which is found in the cells of the solitary bees, but it is other insects which have been stung and paralyzed by the mother wasp. To this super-family belongs a large assemblage of forms which comprise twelve large families, the habits of all being rather similar."[1]

MUD WASP CARRYING HOME A FLY

LIFE HISTORY OF A DIGGER WASP

Let me take Dr. L. O. Howard's "Life of the Digger Wasp" to illustrate the habits of these solitaries. I have watched this wasp by the hour in the fields of New Jersey.

"This large and ferocious wasp, which is in fact the largest wasp in what may be termed the Eastern Central states, digs burrows, usually in clayey soils, and stores in them for food the large dog-day cicada or harvest fly. During the latter half of July, when the note of the cicada is filling the air with its vibrations, this big wasp is often seen flying about the trees from which the song comes. Suddenly the regular note of the harvest fly ceases and in its stead a distressing, discordant cry will be emitted. The wasp has caught its victim and with a quick sting has paralyzed it. In the struggle often both the wasp and its victim fall to the ground, and then the wasp begins the laborious dragging of its prey back up the tree, straddling it with its long legs, although the cicada is bigger than the wasp, and working sometimes for an hour or more until it reaches a height from which it can fly obliquely down to its nest at some distance away. The burrow consists of a gently sloping entrance extending for about six inches, when a turn is made at right angles and the excavation is continued for six or eight inches farther, ending in a globular cell an inch and a half in diameter. Frequently a number of branches leave the main burrow at about the same point, each terminating in a round cell. Each of these cells contains, along in August, one or two cicadas. The delicate, white, elongate egg of the wasp is laid under the middle leg of the cicada, and when it hatches the larva sticks out its head and begins at once to draw nourishment from between the segments of the victim. The egg hatches in two or three days and the larva attains full growth in a week, or a little more. It feeds entirely from the outside, and when full grown spins a white, silken cocoon which is finished at the expiration of two days. When the adult hatches, the next spring, it gnaws its way out of the cocoon and so on up through the burrow to the surface of the ground, thus accomplishing its life round in a full year. This big digger wasp is very abundant in midsummer throughout the Southern states. It stings severely, and, perhaps needless to say, should be avoided."

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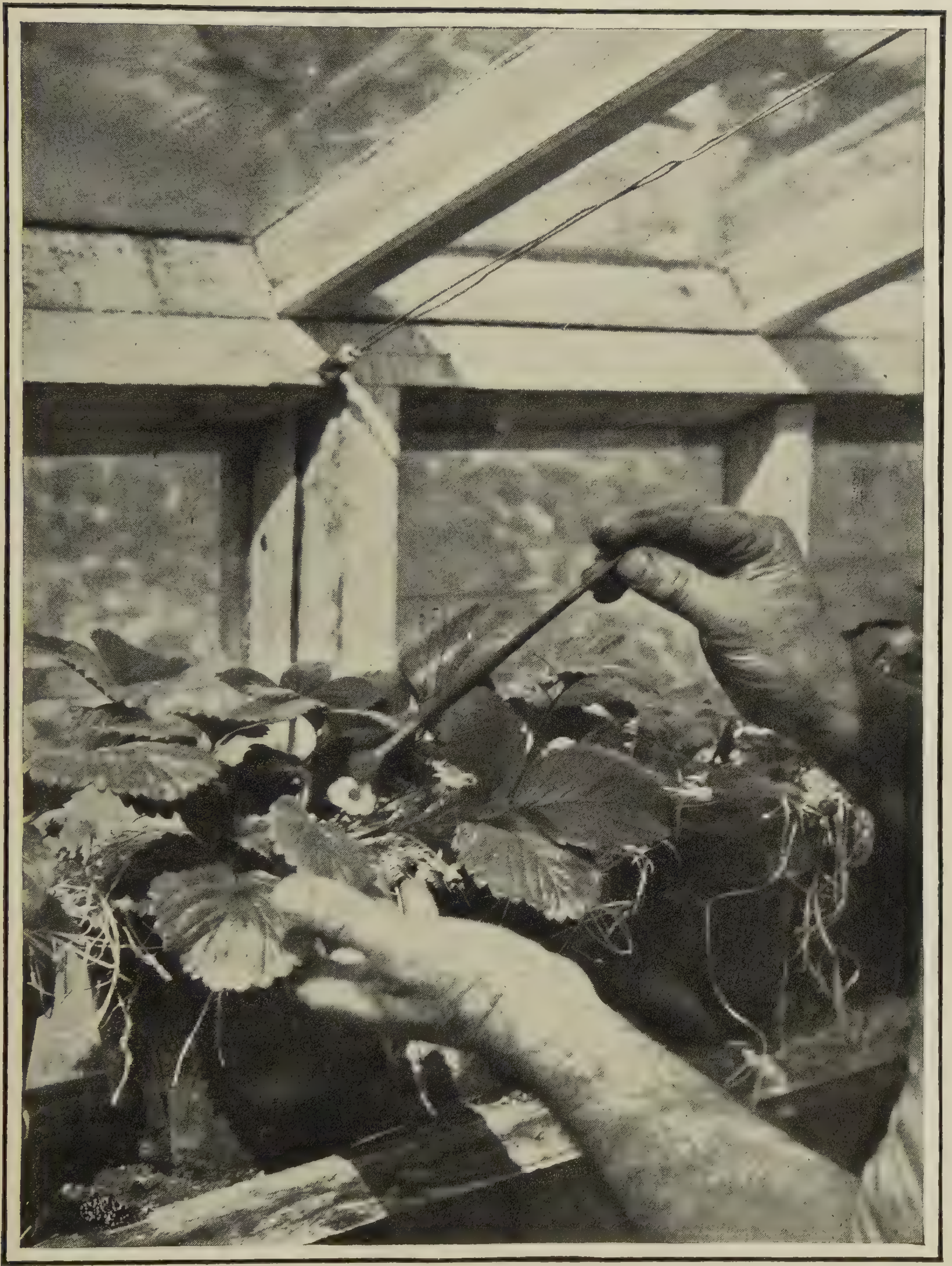
[1] L. O. Howard, "The Insect Book." By permission of Doubleday, Page & Co.



POLLENIZING STRAWBERRY PLANTS BY HAND

In greenhouses where bees and other insects cannot enter this work has to be done by hand labor, as shown.

The easiest colony of social wasps for you to study is the bald-faced hornet, whose huge paper, pear-shaped nests we have all seen.

"The size of the communities varies at the season when they are largest, and according to the species, from a few individuals to many hundreds. In one large nest I counted 1135 cells, and since, as will be shown, the worker cells are used two or three times in the summer, the colonies become very strong. This count was made with the large bald-faced hornet (*Vespa maculata*), but in some of the smaller wasps or yellow jackets, like *Vespa germanica*, the cells are even more numerous. One nest of the latter species was found to contain about fourteen thousand cells.

"These communities of the social wasps, unlike those of the hive bees and of ants, but like those of the bumblebees, have only a temporary existence. On the approach of winter the males and workers perish and the fertile females crawl into such protected situations as crevices in walls or under the bark of trees and there pass the winter in a dormant state. At the opening of spring each surviving female founds a new colony. At first she performs the duties of both queen and worker; a small nest is made, eggs are laid in it, and when the larvæ hatch they are fed and cared for by the queen until they reach maturity. This first generation is composed entirely of workers. They relieve the queen of the duties which belong to them and from this time forth her only duty is to lay eggs."[1]

THE ANTS

More has been written about the ants than about any other family of insects, except perhaps the bees. Certainly no insect life is more highly organized, more nearly a perfect republic in form, than that of the ants. And their habits are often so human!

"It was the naturalist Huber who first made the wonderful discovery that ants regularly visited certain kinds of plant lice or aphids for the purpose of procuring nectar which they

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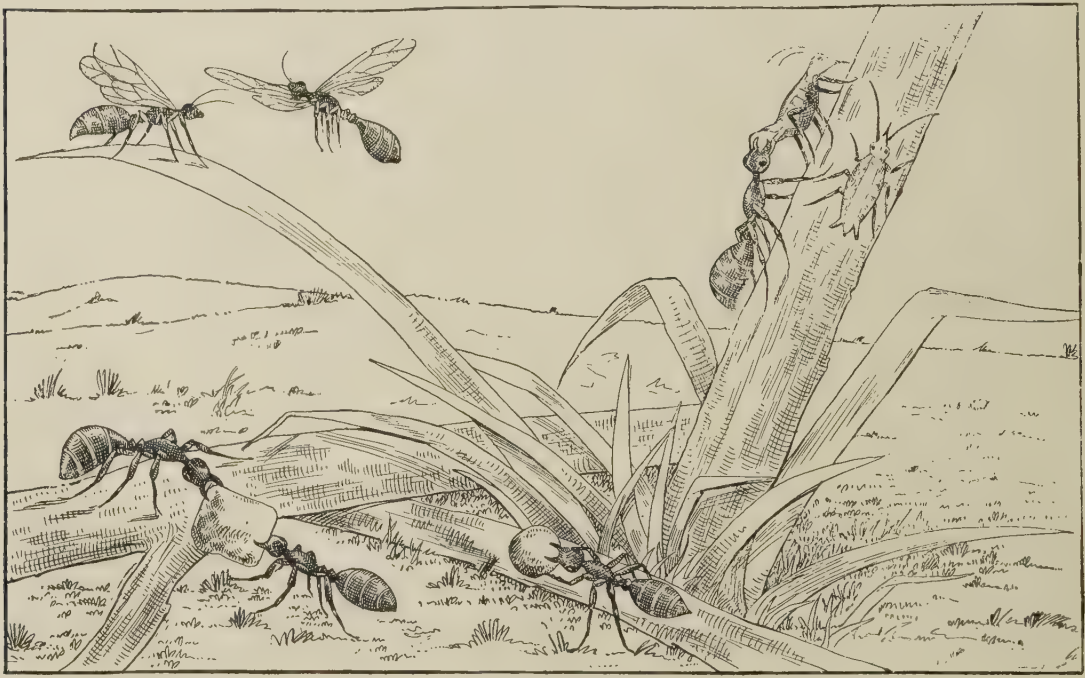
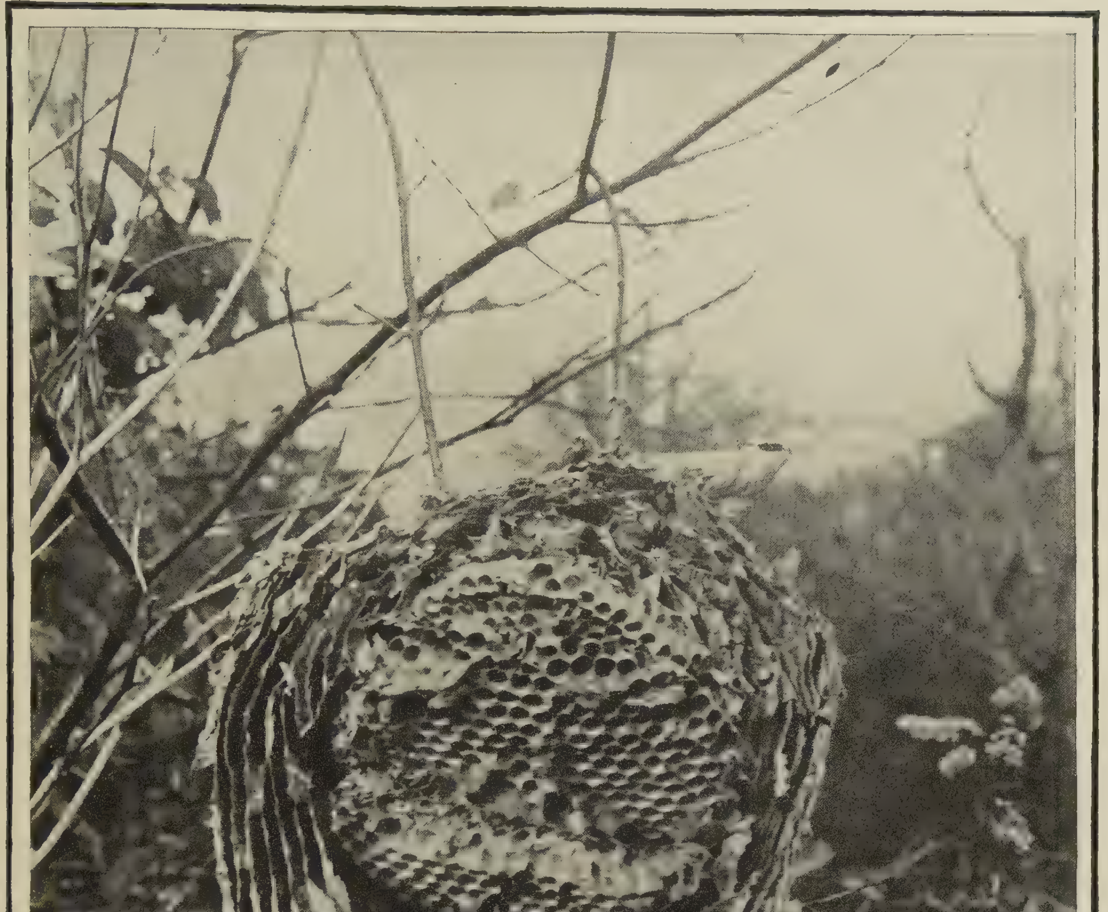
[1] "The Insect Book."



GROUP OF ANTS

Upper left: Male and female ants with wings. Upper right: Ants "milking" their "cows," the aphids, from which they obtain honey dew. The ants at the bottom of the picture show how the workers carry burdens weighing much more than themselves.



SECTION OF A WASPS' NEST, SHOWING ARRANGEMENT OF CELLS got from two tiny tubes on the backs of the aphids. These plant lice are slow-moving, almost helpless mites. They are very numerous and propagate with extreme rapidity, a fact that is quite necessary because they are preyed upon and furnish food for a large number of insects, especially smaller kinds of flies. These latter insects consider the aphids themselves as food, not as sources of food supply, while ants, realizing that the lice are more valuable to them alive than dead, often defend them from other enemies or transport them bodily to other plants where they will be less likely to be attacked and where they can get a good supply of fodder. Each colony of ants has its own herd of these 'cows' and attends to them most assiduously, for they are regarded as among their most valued possessions.

"Not only do ants keep cows, but they very frequently have slaves to work for them. Large colonies of warrior ants sometimes make raids upon neighboring cities of other species, defeat them in pitched battles, and carry home prisoners of war to work for them. The ant wars are no pink-tea affairs, but are bloody conflicts. They go at one another hammer and tongs, one side fighting for conquest, the other for life. Many a head is nipped cleanly off by a clever antagonist, and many a soldier limps homeward after the fray, minus one or more of his six legs.

"As is very well known, bees and wasps have their workers and their drones. Ants are even more social and carry class distinction even farther. They have several classes — drones, workers — these being undeveloped females — warriors, slaves, etc. The fully developed males and females of most species are equipped with wings which they shed after wearing for a short time."

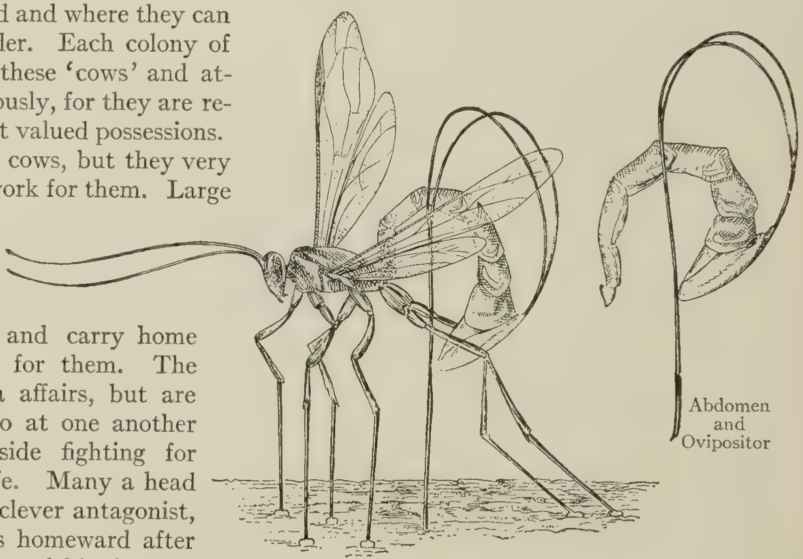
THE ICHNEUMON FLIES

One of the mysteries of Nature is the way life preys upon life — the higher eating up the lower, and sometimes indeed the lower eating the higher. But among all this preying, no form of it is so astonishing as that of the parasite ichneumon flies.

They are our friends. Take the case of *Thalessa lunator*, for instance. Notice her "sting" — not a sting at all, but an egg tube — ovipositor — by which she deposits her eggs in the body of her prey.

Thalessa preys upon the pigeon Tremex (*Tremex columba*). "Adult insects of this latter family are known as 'horntails,' because the end of the body terminates in a sharp point or horn. The larvæ are known as 'wood borers,' many of them doing a great deal of damage to shade trees.

"Tremex is an enemy to oak and elm trees. She has a short but strong ovipositor, with which she bores directly into the wood for a depth of about an inch, at which depth she deposits her eggs. In about two weeks these eggs hatch, and the grubs, or Tremex larvæ, commence to bore through the wood; they live upon the wood and its juices, the boring of which when persisted in by numbers of them saps the life of the tree.



ICHNEUMON FLY

"Now Thalessa enters upon the scene; with her arrival, the fate of the Tremex worm is sealed. How she knows just where to bore is a mystery man cannot solve, but she always selects a spot just over the tunnel in which the Tremex larva is working. It is then that her wonderful ovipositor comes into play; this is one of the most marvelous drills in the world, the like of which it is beyond the power and skill of man to create. Little larger than an ordinary horsehair, yet it is a tube through which Thalessa can lay her eggs; flexible as a hair, yet it is sturdy enough to penetrate oak. Taking her position on tiptoe, body perpendicularly elevated relative to the branch, ovipositor curved sharply over the back, Thalessa commences drilling. It is slow work and hard work; it may be several hours before she gets to the necessary depth, which may vary from one to three inches. Usually when she has to drill to the latter depth she is so exhausted by the labor of boring and egg laying that she is unable to withdraw the drill and perishes.

"The eggs hatch within a few hours and the tiny but active larvæ immediately wriggle along in search of the food that they know is somewhere near. They soon overtake and attach themselves to the Tremex worms, upon which they subsist, growing very rapidly. So one insect gives up its life that another may live."[1]

When you stop to think of all the families of flies, bugs, beetles, and crickets — the task of even naming the families becomes the subject of something like a book. All of that must be left to the special student. We hear the crickets and we should like to know who they are that fiddle and fife away in the grass.

BALLOONING SPIDERS

TRAPDOOR SPIDER AND ITS HOME

"On midsummer evenings, no one with an ear for rhythm can fail to notice the incessant chorus, or more properly orchestra, of those queer, slender, green insects which are called 'August crickets.' Occasionally one finds its way into a house and his note then sounds melancholy and lonely, not cheerful like the voice of the black cricket whose association is with the hearth and which is supposed to betoken good will. The beat of the united voices or zither notes of the millions of these tiny creatures seems to follow some unseen leader's direction. Rarely does one get out of time and saw away at cross purposes. To many persons the noise they make is decidedly unpleasant, but it is certainly not so rasping as the quarrelsome contradiction of the katydid.

"It is not generally known that the August crickets are a natural thermometer. By carefully counting the number of vibrations to a minute one can tell accurately what the temperature is. The hotter the evening the more

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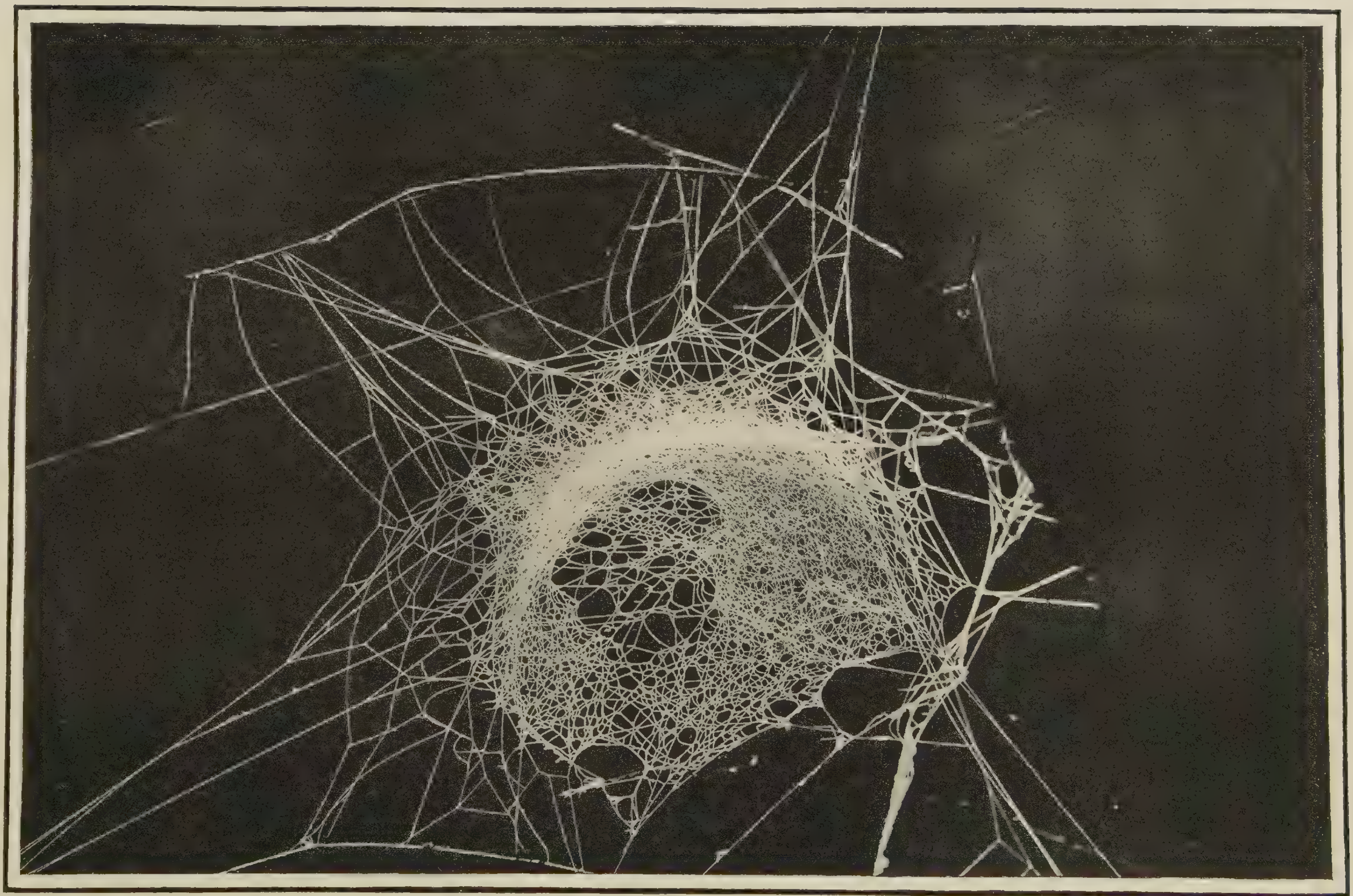
[1] "Nature Studies in Field and Wood," by Chester A. Reed. By permission of Doubleday, Page & Co.



Courtesy of Boston Society of Natural History

DOME-SHAPED WEB OF THE SPIDER KNOWN AS LINYPHIA MARGINATA rapidly they play their sharp little instruments, and, as the days shorten and the nights become cooler, their waves of sound have greater distances between them, until, when a frost is threatened, only now and then one more enterprising than the rest keeps up a forlorn hope of sound. Why they are moved to join Nature's great orchestra is a problem no one can answer. It would seem to be hard work to rub their wings together so assiduously; it must be wearing on the corrugated little veins. Probably they can't help it: 'it is their nature to.'"

These, I say, we wish to know. We also see the spiders in the roadside weeds and in our cellar windows. Who are they? we ask — and have a right to know, however full of other interests life may be. But as for the multitude of lesser insect folk, only the specialist can know them. If you are interested, turn to the list of books in the back of Dr. L. O. Howard's "The Insect Book" and you have guide enough.

WEBS AND THEIR MAKERS

"An early morning walk discloses numbers of beautiful webs glistening with dew. How dainty and exquisite some of the patterns! What skillful workers spiders must be to produce such designs! Yet spiders are loathed by most persons. Why? Probably because they are not informed as to the value of spiders in the economic world and very greatly overestimate the dangers from them. True, some spiders will sting; so will a dog bite; so will a cat scratch; and so will a man clinch his fist in self-defense. It is human, animal, and insect nature to defend when attacked, and we must admire them for it. A spider is never the aggressor in an attack on man.

"One of the prettiest of the spiders and one of the most common in eastern United States is the Orange (*Argiope aurentium*). This creature also sets one of the most regularly graceful webs for the ensnaring of its insect victims; the silken meshes are very closely stretched about the center, making a firm base on which she often rests while awaiting her prey.

"Spiders, especially the smaller ones, as well as all other animate things have the wanderlust, and they construct remarkable vehicles to carry them on their voyages. They are aëronauts of no mean ability. When a spider's ambition turns to ballooning, it hies away to a fence post, a twig, or it may be the top of a goldenrod. Our spider takes a firm hold with its legs, elevates its body at an angle of about forty-five degrees, and commences spinning silken threads. The liquid silk comes in five tiny jets from the spinnerets on the lower part of the abdomen; solidifying on contact with the air, if atmospheric condition are right these fine threads will float upward As the silk strands lengthen we can see that the spider is gripping the support for all he is worth to counteract the lifting effect of his filmy balloon. When the threads have attained a length of from six to twenty feet, if he thinks the pull is sufficient the little aëronaut springs upward, grasps a cord with each foot, and goes sailing upward and away on the breeze. Often the silk thread does not prove sufficiently buoyant, in which case it will be cast adrift and a new one started. These cast-aside cords may often be seen caught on bushes or floating in the air."[1]

THE DANCE OF THE MAYFLIES

A winged snowstorm! The misty air of the early June night showed no signs of storm — least of all a snowstorm; and yet, as I came out of the woods to the bridge over the river, the flakes were flying, millions of them, till the twilight was thick to smothering!

Over the bridge, over the water, over me, over everything they were settling, as if a gauzy net were being spread upon the earth, a fabric of lightest gossamer lace that kept stirring as by some gentle breeze.

It was the dance of the Mayflies, the *Ephemeridæ*, strange little creatures, that were dying as they danced. They are one of the sights of the summer.

The Mayflies, or dayflies, or *Ephemeridæ*, have passed into proverb as the symbol of gay and thoughtless living. And you cannot escape the thought either, as you are watching them fluttering their little lives away — finding

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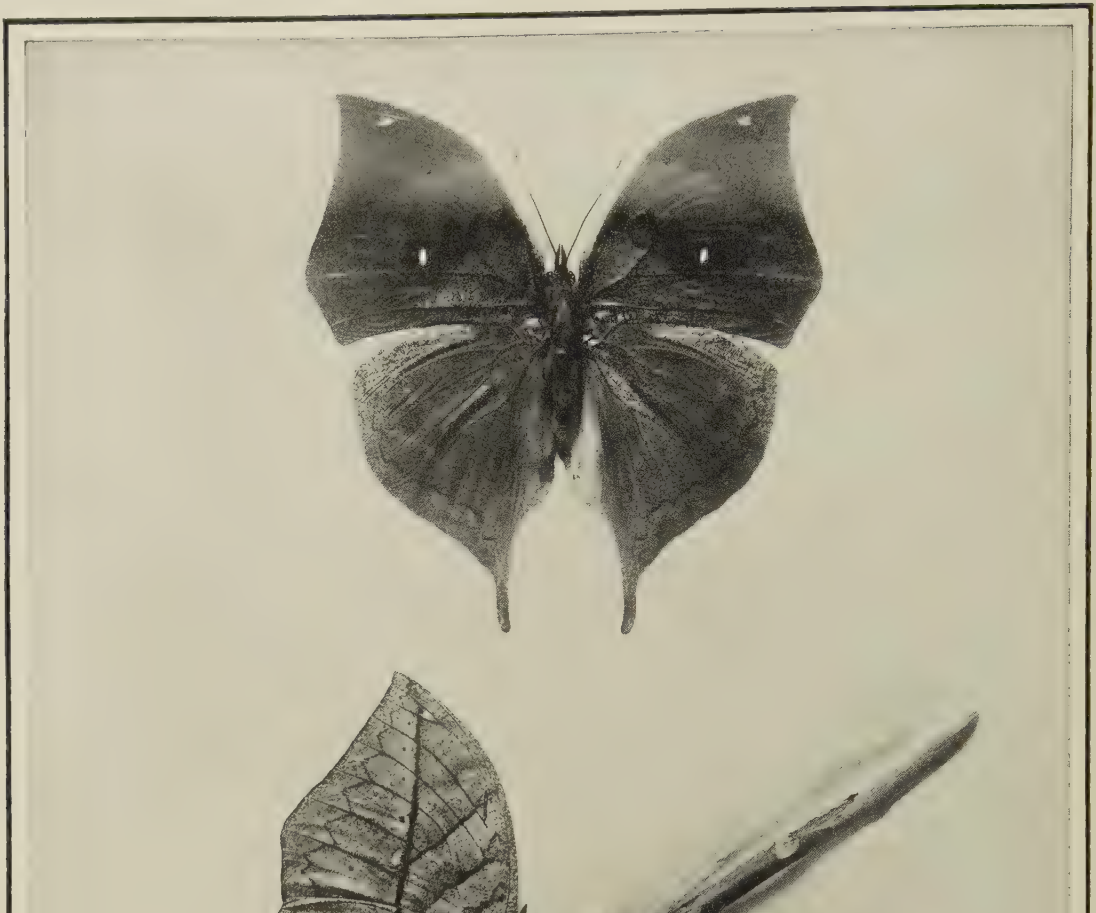
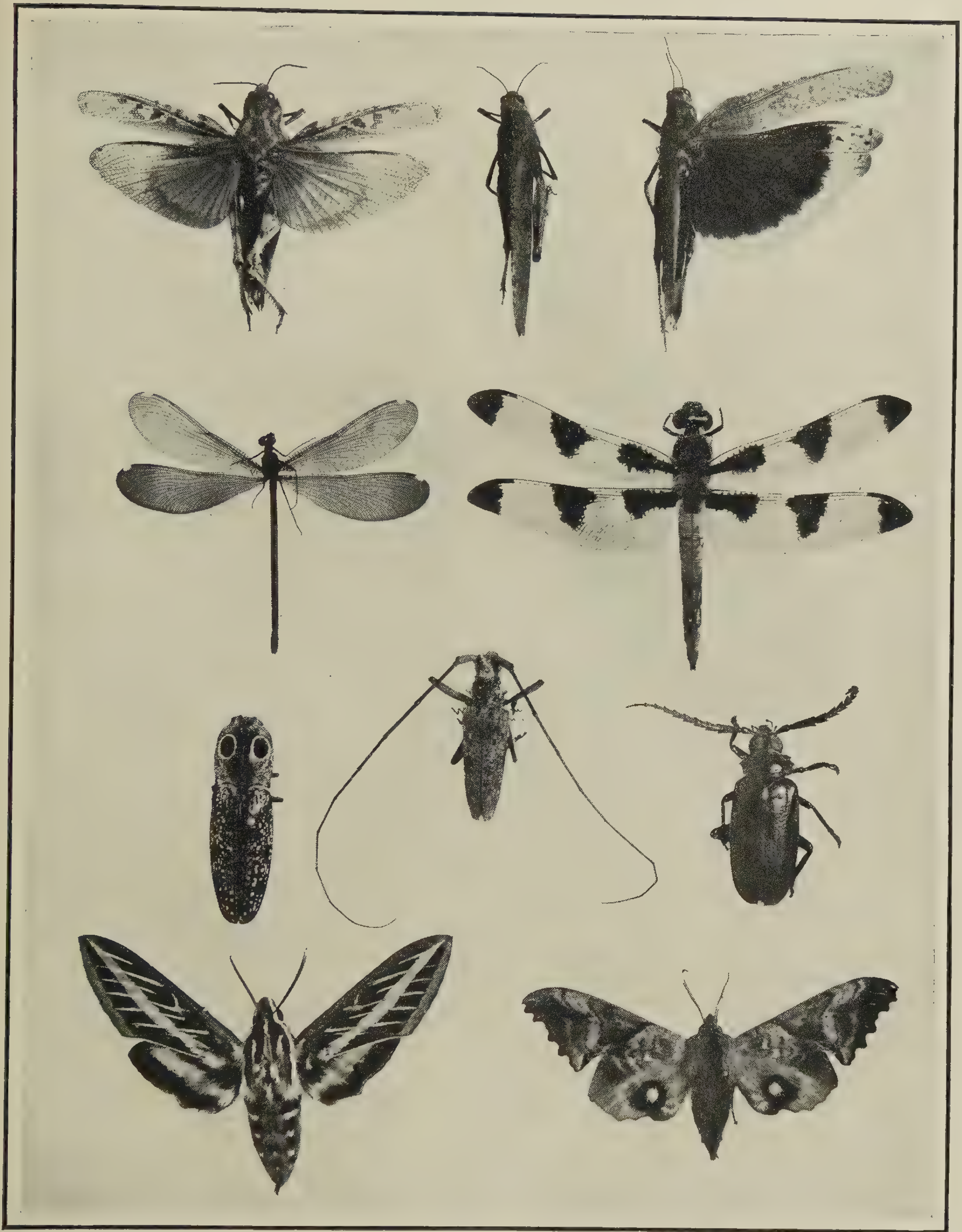
[1] "Nature Studies in Field and Wood."



Courtesy of Boston Society of Natural History

KALLIMA OR LEAF BUTTERFLY, FROM INDIA, A WELL-KNOWN EXAMPLE OF PROTECTIVE RESEMBLANCE

Upper: Wings expanded in flying. Lower: At rest on twig, with wings folded and resembling a dead leaf.



Courtesy of Boston Society of Natural History

A GROUP OF INSECTS

Upper row: Grasshoppers; left, Carolina grasshopper (*Dissosteira carolina*); center, same, wings closed; right, coral wing grasshopper (*Hippiscus tuberculatus*). Second row: left, damsel fly (*Calopteryx maculata*); right, dragon fly (*Libellula pulchella*). Third row: Beetles; left, "big-eyed" snapping beetle (*Alaus oculatus*); center, wood sawyer (*Monohammus confusor*); right, (*Prionus pocularis*). Bottom row: Hawk Moths; left, white-lined morning sphinx (*Deilephila lineata*); right, (*Paonias excœcatus*).

their wings after three years, it may be, of grub life under the water, only to fly into the evening air to perish before the next sunrise.

It is generally supposed that they live only for a single day. That, however, is not quite correct. It is true that the curious creatures nearly always die on the same day on which they make their appearance, though many live for two or three days. But when we remember that before they became perfect Mayflies they were first grubs and then chrysalises, just as butterflies and moths are, and that in these states they lived for two or three whole years, their lives are not so short after all.

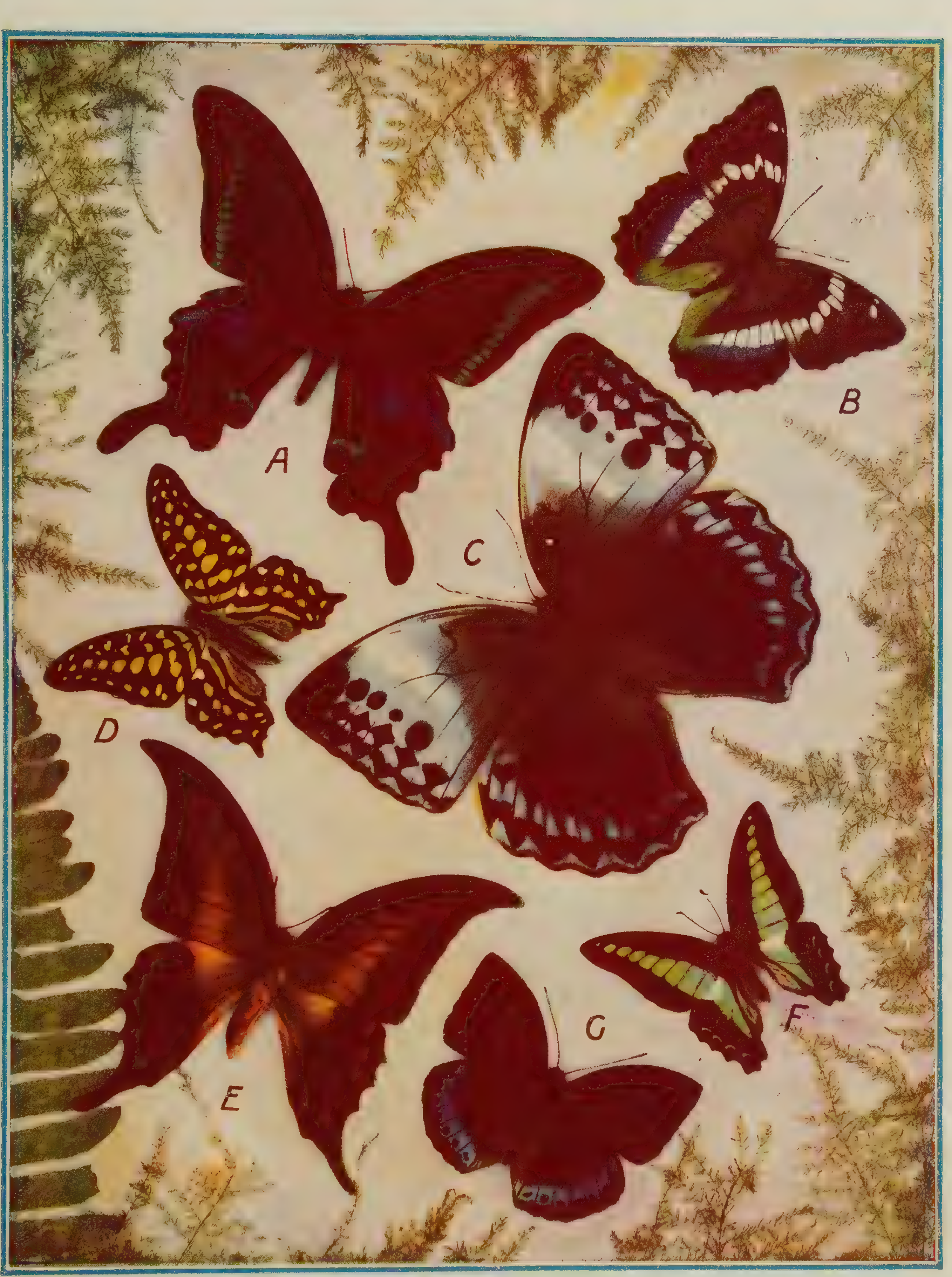
It is not very easy to find the grubs of the Mayfly, for they live in little burrows in the banks of the stream, below the surface of the water. These burrows are always shaped like the letter U, having two entrances, so that they can go in by one and out again by the other without having to turn around. And they spend most of their time inside them, coming out into the water to look for food.

Then out in the water, also looking for food, are trout, bass, perch, crappies, and other fish, whose taste is exactly suited with a serving of Mayflies. Indeed, the larvæ, or nymphs, as all the early stages of Mayflies are called, form one of the most important foods of several of our fresh-water fishes. And some of the most popular of artificial fishing flies in England — the "duns," the "drakes" and "spinners" — are imitations of Mayflies.

The dancing flies drop their eggs into the water; or, strangely enough, the females in a film or bladder of air sometimes creep under the water and deposit their eggs.

"While they are in the grub and chrysalis states the creatures change their skins at least twenty times, a new garment always being formed underneath the old one, as soon as it becomes too tight. And when at last the perfect insects make their appearance, a very curious thing indeed happens. They leave the chrysalis with *two* skins on instead of only one! It is just as if you were to wear two suits of clothes, or two frocks, one over the other. But they do not seem at all comfortable; and instead of rising at once into the air, and beginning their singular dance, they fly to the nearest tree and settle upon the branches. Then, after a few minutes, their outer skins split, and they creep out of them clad in their inner skins only, and, after resting for a little while, they mount into the air, leaving their cast-off garments clinging to the branches. This is the sub-imago stage and this is the only insect that makes this double change.

"The next time you see a cloud of Mayflies dancing in the air, hunt about in the branches of the trees close by, and there you will find thousands of these empty skins, looking almost exactly like the living insects."



EXOTIC BUTTERFLIES

A. Papilio arcturus (Assam, India).
D. Papilio agamemnon (Malacca).

B. Euthalia species (Assam, India).
E. Papilio evan (Assam, India).
G. Symphaedra khasiana (Assam, India).

C. Stichophthalma camadeva (Assam, India).
F. Papilio sarpedon (Siam).

ON THE ANIMAL TRAIL

A BIRD'S-EYE VIEW OF THE ANIMAL KINGDOM

THE whole animal kingdom numbers more than half a million different kinds of living forms. Out of this half-million you will perhaps come to know *personally* two hundred or more. By books and other means you can learn the general facts about five hundred more — perhaps a thousand more. You see at once that half a million different animals (that is, insects and all things living that are higher in the scale than plants) are too many for anyone to know intimately. Nor is that the object of this book. Bear in mind that our purpose here is to invite you out-of-doors, into your own fields and woods, and to go out with you, as the author himself might go with you were it possible.

At one time Mr. John Burroughs came out to see me at Mullein Hill, and with the four small boys we all went off for a delightful walk through the woods. We did not see everything nor talk about everything on that walk. We did see a few interesting things and talked about many more, however. So it is in such a book as this — we shall *see* some interesting things and talk about many interesting things, but all to this purpose, namely, that we may get to know and love our own living things and the beautiful world in which they live.

Now a half-million animals, because of their very multitude, may trouble you. If so, then we shall learn some things about *all* of them — the whole half-million — at once and so dispose of them all as grocers dispose of the half-million kinds of things on their shelves so that they can lay their hands on a can opener or a pound of caramels on demand.

Different zoölogists arrange the whole animal kingdom, with some variations, after the following scheme. Beginning with the simplest single-celled animals, like the amœba, for the bottom, the relationship plan is thus:

Tabular View of the Eight Branches of the Animal Kingdom

Branch VIII. *Vertebrata.* Fishes to man.
Branch VII. *Arthropoda.* Crabs (crustaceans) and insects.
Branch VI. *Mollusca.* Clams, snails, cuttlefish.
Branch V. *Vermes.* Flat and round worms, polyzoa, brachiopods, annelids.
Branch IV. *Echinodermata.* Crinoids, starfish, etc.
Branch III. *Cœlenterata.* Hydra, jellyfishes.
Branch II. *Porifera.* Sponges.
Branch I. *Protozoa.* Single-celled animals.

There are the whole half-million in one short section. Now take the eighth branch, the vertebrata (those having a backbone), and we can arrange the whole of them in a series of related orders (not branches now) thus, beginning with the lowest or most primitive forms:

Class 1. *Pisces.* Aquatic cold-blooded forms with gills and usually paired fins, but not legs. Fish.

Class 2. *Amphibia.* Cold-blooded forms without scales, usually with two pairs of legs, and breathing by gills in early life. Frogs, salamanders, toads.

Class 3. *Reptilia.* Cold-blooded forms with scales and lungs. Snakes, lizards, turtles.

Class 4. *Aves.* Warm-blooded vertebrates with feathers. Birds.

Class 5. *Mammalia.* Hairy vertebrates suckling their young. Dog, monkey, man.

Now take the fifth class, the mammals (animals with breasts), and we can divide these into eleven *orders* (not classes, nor branches), thus:

Order 1. *Monotremata.* Egg-laying mammals. Duckbill, spiny anteater.

Order 2. *Marsupialia.* Mammals whose young at birth are very small and immature and are therefore placed in an abdominal pouch to be nourished several weeks. Opossums, kangaroos.

Order 3. *Insectivora.* Mammals living largely on insects. Shrews, moles.

Order 4. *Edentata.* Forms in which the teeth are often wanting and if present there is no enamel. Sloths, anteaters.

Order 5. *Chiroptera.* Forms adapted for flight. Bats, flying foxes.

Order 6. *Rodentia.* Mammals having usually two elongated chisel-like incisors in each jaw. Rabbits, squirrels, mice, rats.

Order 7. *Cetacea.* Marine mammals with fishlike body and no hind limbs. Whales, porpoises, dolphins.

Order 8. *Sirenia* (siren). Aquatic forms with no hind limbs. Sea cows.

Order 9. *Ungulata.* Mammals which have hoófed feet. Horses, cows, pigs.

Order 10. *Carnivora.* Mammals living on flesh and with strong canine teeth and claws. Dogs, cats, wolves, foxes.

Order 11. *Primates.* Mammals with thumb opposable to the other digits. Lemurs, monkeys, man.

Here, then, are eleven *orders* comprising the single *class* Mammalia. Any animal of this kind (that suckles its young) that you may come upon in your woods or in any zoölogical garden will fall under one or another of these eleven orders.

Take the first order, for instance, and nowhere in North America will you find a member of that order wild. The duckbill and the porcupine anteater, its two curious members, live in Australia, a variety of anteaters being found also in New Guinea.

THE OLDEST OF OUR MAMMALS

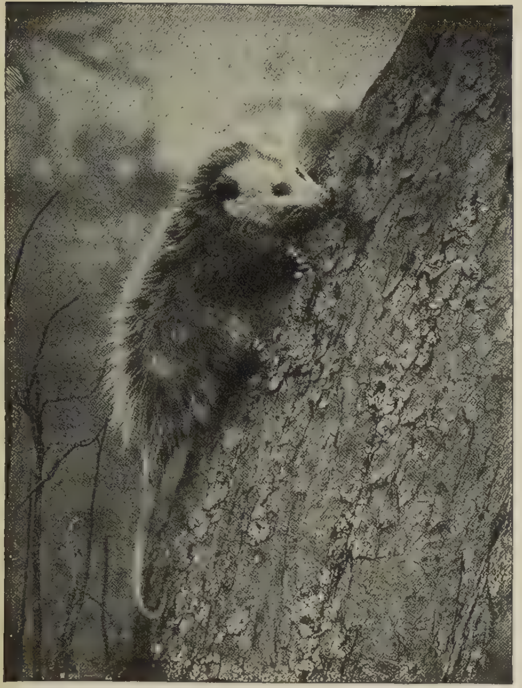
BUT closely related to these half-mammals and just a little higher in the animal scale is our opossum, a true American, and our only representative of the marsupialia order. So that if you cannot watch the habits of the duckbill you can do the next best thing — go on a possum hunt.

The Opossum. For those of you who live from New York State southward and westward there is a chance for most interesting study of a singular animal form in the opossum, or "possum" for short. No other American mammal comes so near being un-American in habits and relationship as he, for all his ancestors seem to belong to Australia. He is a marsupial (the word means "pouched"), having a pouch or false abdomen in which the young are carried, as the kangaroo and other primitive Australian forms have.

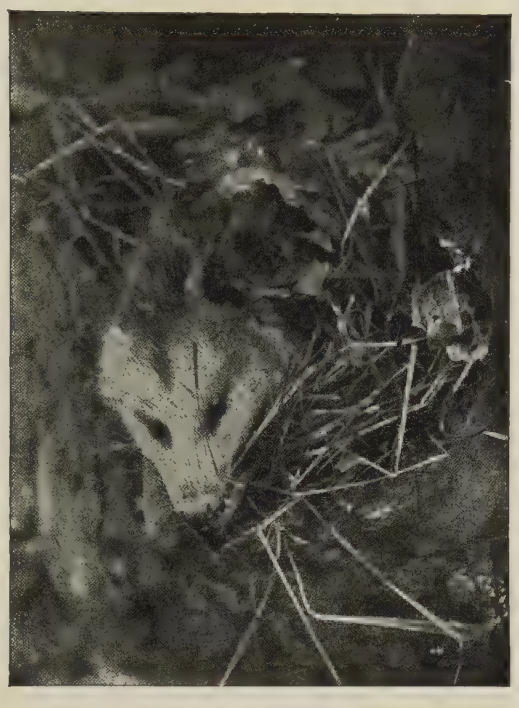
Marsupials are found also in Tasmania, New Guinea, and the Moluccas. These islands the marsupials seem to have had given them for their own when the world was made. There, at least, most of them live and have lived for ages, except the possums. These latter, strangely enough, live in North and South America, and nowhere else. The peculiar, puzzling thing about them is: how they only got away from Australia across the sea to America. Did a family of them get set adrift on a log and float across? Or was there once, as geologists tell us, a long strip of islands close together, stretching from the tip of South America, from the "Horn," off across the sea to Australia, over which the possums might once have made their way? But if he came by such a route, why did not the kangaroo come too? Ah, the kangaroo is not a possum. There is no other creature in the woods that would dare play "follow my leader" with the possum.

However, I am half inclined to think that the scientists are right who say that the possum is the great-great-grandfather of all the marsupials, and that the migration might have been the other way about — from America across the sea.

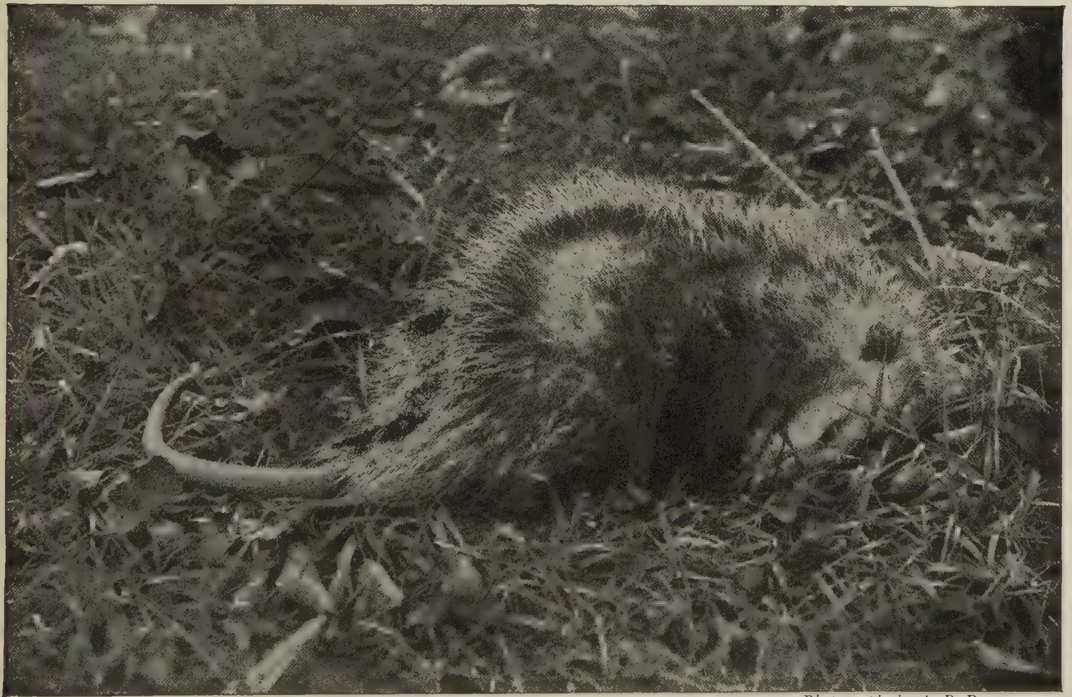
However that may be, here in our possum we have a very primitive mammal, one of the



CLIMBING



LOOKING OUT OF NEST



Photographs by A. R. Dugmore

THE OPOSSUM (*Didelphis virginiana*)

The lower picture shows the animal "playing possum." The upper left-hand picture is a photograph of the same specimen an hour later.

very oldest mammals, so close to the beginning of the mammalian line that there are only two other living "animals" older and more primitive — the porcupine anteater, and, oldest of all, the duckbill.

"The duckbill, though placed among the mammals, not only has the bill of the duck, but also lays eggs like the birds. The porcupine anteater likewise lays eggs (rather *an* egg) and so seems almost as much bird or reptile as mammal. And as the birds and reptiles lived upon the earth before the age of mammals, and are a lower and more primitive order of creatures, so the duckbill, the porcupine anteater, and the possum, because in their anatomy they are like the birds and reptiles in some respects, are perhaps the lowest and the oldest of all the mammals.

"The possum, thus, is one of the oldest of the mammals, dating as far back as the reptilian age, when only traces of mammalian life are to be found, the possum's fossil ancestors being among the most notable of these early remains. The mammals at that time, as I have just said, were only partly mammal, for they were partly bird or reptile, as the duckbill and anteater still are. Now the possum does not lay eggs as these other two do, for its young are born, not hatched; yet so tiny and undeveloped are they when born, that they must be put into their mother's pouch and nursed, as eggs are put into a nest and brooded until they are hatched—really born a second time."[1]

All the young of the pouched animals are extremely small at birth, when they are immediately transferred to the pocket formed by the skin of the mother's abdomen. Nourished by milk, they remain there, as in a living cradle, till able to take care of themselves.

No other mammalian baby is so much of a baby. It weighs only four grains. Four grains! Think how small that is! For there are seven thousand grains to one pound, which means that it would take 1750 baby possums to weigh as much as two cups of sugar.

SOME OF THE POSSUM'S RELATIONS

Among the relatives of the possum, of its immediate family, are, besides the kangaroos and the wallabies (smaller species that live in the brush), the tree and rat kangaroo, the spotted cuscus and the true phalangers, the marsupial mole, the spotted dasyure or nature cat of Australia and Tasmania, and the Tasmanian wolf and its near relative the Tasmanian devil.

The Tasmanian Devil. The ursine dasyure, or Tasmanian devil, which appellation does not suggest that the animal possesses any very lovable characteristics, has a reputation, indeed, that is blacker than its coat, which here and there shows redeeming patches of white. "Except for its longer tail this ugly dasyure generally resembles a bear, or what a bear might be if it grew no bigger than a badger. It is shortish, with a broad head, and its mouth is furnished with teeth distinctly carnivorous in character. It is strictly a nocturnal animal, scarcely able to see in daylight, during which it coils itself up in a cave, other rocky lair, or a burrow of its own construction, from which at night it issues to prey upon any living creature that it can overpower. Mammals, reptiles, or even dead fish on the seashore are all welcome to this voracious feeder.

The Tasmanian Wolf. "The thylacine, or Tasmanian wolf, is the largest of the carnivorous marsupials.

"Very doglike, narrow-muzzled, and clean-limbed, the thylacine attains a length of four or five feet, including the tail. Its coat is mainly grayish-brown with a dozen or more transverse black bands across the back and loins, which gain for it the title 'zebra wolf.'

"Hunting by scent like a true dog, the thylacine exhibits tremendous staying powers. For hours on end in a steady canter it will track down kangaroos, wallabies, and smaller marsupials, leaving its young to follow at their leisure to join in the feast that will probably await them. Nothing could have suited it better than for sheep to have been introduced into its native regions. The imported flocks speedily suffered to such an extent that the Tasmanian government put a price upon the heads of the marauding tribe; and this, in conjunction with the increasing settlement of the island, has led to the extermination of the thylacine except in the more secluded mountainous regions."[2]

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[1] From "Winter."

[2] "Handy Natural History," by Ernest Protheroe.

"**The Duckbill Platypus** is as lithe as a cat. The skin, too, is so loose that when one is shot its bones will be broken, though none of the shots penetrate the skin. As it catches its food it stows it away in its capacious cheek pouches.

"The Platypus is shy and retiring and strictly nocturnal in habit. Its burrow, thirty to fifty feet in length, always contains two entrances — one under water and the other usually in a thicket at some distance from the water's edge. The difficulties of watching such an animal are very great, and for many years it was a puzzle to naturalists. It was not until 1884 that it was proved to lay eggs, two of which are deposited in a loose nest of weeds and roots at a secure point in the burrow. The covering of the egg is flexible, as in the case of many reptiles. The female's pouch is simply a fold in the skin, and that is only present during the breeding season; there are no teats, but the mammary gland swells into small projections, which can be seized by the pulpy lips of the young. The young animals are very playful, and in captivity are as droll and interesting as puppies."[1]

POSSUM HUNTING

There are many others of the order, but the possum is enough to give us a glimpse into the life history and relationships of them all.

As a boy I hunted the possum in the winter woods, and on one Christmas vacation brought more than a score of live ones back to college with me for scientific study in the biological laboratory.

To go into the winter woods at night for possum, across the wide, moonlit fields, covered it may be with the glistening snow, is truly a rare kind of hunting. The full moon rides overhead, the pointed corn shocks stand silent over the fields, the woods rise dark and shadowy beyond. Only the slow, musical cry of the hound echoes through the stirless air, which seems to sparkle like the snow.

Your slow, rheumatic old hound sticks to the trail with the endurance necessary to carry it to its end, and that end may be in a hollow log, or great gum tree, or under a shock of corn or a rail pile, or, as once happened to me, in a henhouse and in a stove in the henhouse, where, upon the grate, three possums had their nest!

But to be abroad in a world so large and silent, so crystal clear, so crisp, so a-creep with shadows, so deep and mysterious in its distances, so pure and unblemished in its cover of snow, is quite enough even if you do not catch your possum.

You have peered into his black hole; you have reached in and tried to pull him out — nothing more. No roar of a gun has shattered your world of crystal; you have killed nothing, wounded nothing. That after all is best.

But when you get your possum by the tail, he smiles at you — grins, I ought to say — has a fit and dies! To go hunting for a creature that smiles at you in a dreadful manner when you capture him, that flops down in a dead faint or throws a fit when you take him up by the tail, that shows the spunk and fight of a cabbage boiled — to go hunting for such a beast is exciting, as exciting as going to the store for a quart of beans.

No, he does not die. He simply "plays possum" — another of the interesting points in the life of this queerest of Americans.

THE LEAST OF ALL MAMMALS

If you will turn to the list of orders of mammals you will find coming third in the list the insect eaters, the shrews and moles. To be sure, there are many other insect eaters than these of this family; but there are certain peculiarities that place the moles and the shrews together in an order by themselves.

The Shrew. If you have imagination enough, put a shrew alongside of an African elephant to see to what extremes the mammals have developed — two and one half inches all told against eleven and one half feet—the height of Jumbo, upon whose back I once climbed; or, if you weigh the shrew, two ounces against six and one half *tons* — Jumbo's dainty weight. Jumbo was an African elephant reared in captivity. Why should not the wild elephant exceed that enormous size?

But to come back to the shrew. The probabilities are that all of you have seen Indian and African elephants — herds of them — but not many of you have ever seen our savage little shrew.

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[1] "Handy Natural History."

Here is game for you — a shrew hunt. If you will set any kind of wire trap, baited with meat, you will be likely to capture (in the Eastern states) the large *mole* shrew (five inches long); and a fiercer, more carnivorous little beast never got into a trap.

Their keen noses enable them to scent food at a considerable distance, and when they have succeeded in finding any that may have been left by the larger hunters they fall upon it ravenously, tearing at it and devouring it with all the ferocity of wolves.

"One that I caught in a trap," says Mr. Stone, "had already, when I found it, disposed of the raw meat which had served as bait, and when confined in a cage immediately seized upon whatever meat was offered it, whether raw or cooked, without discriminating between kinds. Beef, pork, and cold chicken all went the same way, while the fury of his appetite was being appeased. Both in eating and drinking the projecting, tapirlike nose or trunk was turned up in order to enable him to use his mouth more freely, for a shrew's mouth opens from beneath almost like that of a shark. The sensitive trunk is doubtless of service in poking about beneath the leaves and in soft earth after worms, of which the mole shrew is particularly fond."

The same writer says: "They are obstinate, savage little brutes, but are unquestionably of immense service to the farmers, spending their lives in a most vigorous pursuit of insects of all kinds. They combine impartially the habits of the moles and shrews, sometimes burrowing along just beneath the turf, which they push up in low ridges which intersect each other, apparently quite at random, without exhibiting any of the system characteristic of the works of the mole."

The shrews do not hibernate, and whether the mole shrew ever passes the entire winter burrowing about in the ground beneath the frost or not is hard to determine. At all events, numbers of them are out on the surface of the snow, even in the very coldest weather. Part of their food at such times is obtained by gleaning after the owls and foxes and other hunters of the woodland, but they are great hunters and there is no time when insects of one sort or another cannot be turned up to tide them over the cold.

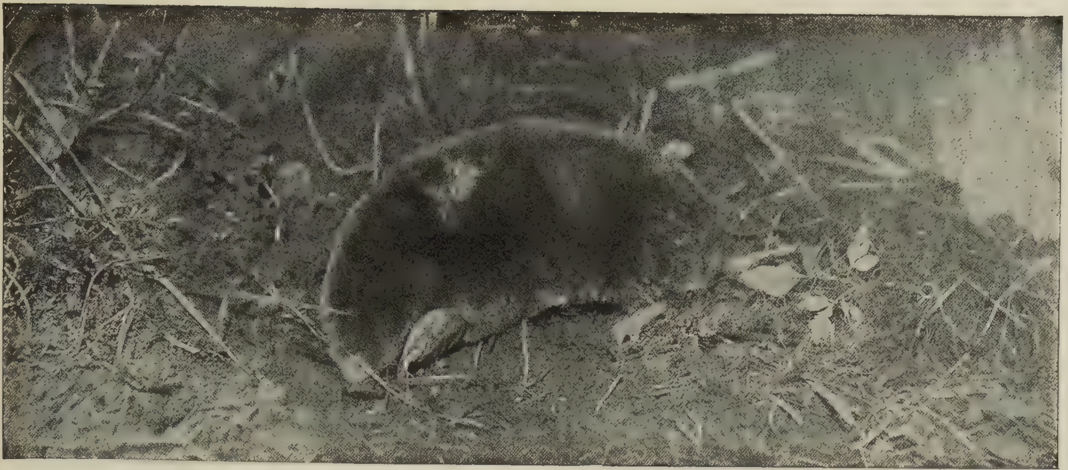
This shrew is one of the short-tailed group, whereas the "common shrew" or shrew mouse (the least of them) belongs to the long-tailed group. There are some eleven species of shrews in North America.

The common shrew is usually about two and three quarters inches in length, of which quite half is accounted for by the tail. The attenuated snout is the chief feature of the head. The body and the tail are covered with fine, velvety fur, reddish mouse color above and gray beneath. Grubbing with its long snout for worms and insects, it makes long runs just under the surface of the ground. Insects are preferred to anything else, but the little creature will attack lizards and frogs and even very small birds. In spring there are fierce fights among the males for mates. The nest of leaves and dry grass is made in a hole in a bank, in which from five to eight young ones are born in July or August.

Place beside this mite of a mammal a common house mouse and the little mouse looks by comparison almost like a rat! And yet, strangely enough, so fierce is the appetite, so terrible the hunger of the shrew, that in England during the autumn large numbers of dead shrews are found along the hedgerows and in ditches, without any evident cause of death. There is no apparent external injury, and certainly they have not met their end by weasels, hawks, or owls, or other of their natural enemies, or they would have been devoured. It has been suggested that with the autumn there comes a lack of food owing to the decreasing insect life, and that is the best explanation or surmise yet offered.

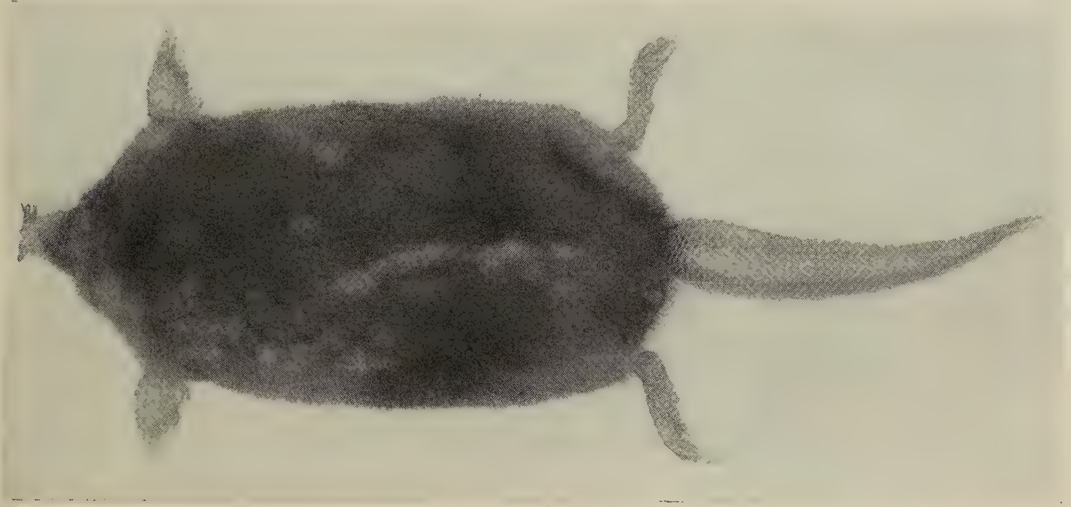
The pygmy shrew of England is an *inch* smaller than the common shrew — the smallest mammal in the world.

The Mole. Another member of this order is our common mole. There are two species, the common and the star-nosed moles. They used to be a great nuisance in my garden, for while they were after insects, injurious insects, too, they made no bones of going right under a hill of peanuts or sweet potatoes or melons and rooting them entirely up. I don't know whether the seed catalogues advertise a mole trap nowadays, as they used to do; but I hope not. I hope the gardeners have learned



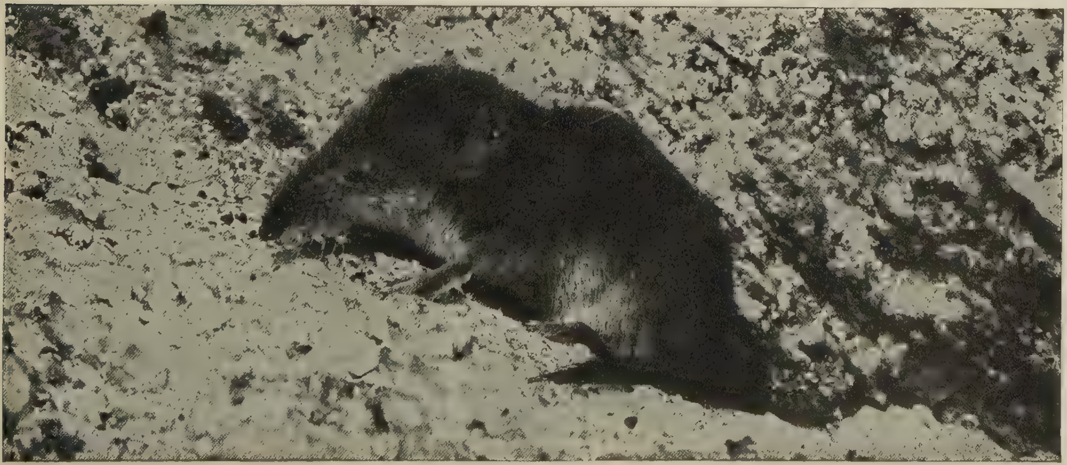
By A. R. Dugmore

COMMON MOLE (*Scalops aquaticus*)



By Dr. W. J. Hamilton, Jr.

STAR-NOSED MOLE (*Condylura cristata*)



By W. E. Carlin

MARSH SHREW (*Sorex palustris*)

better than to kill the moles. Like the shrews, they are voracious eaters.

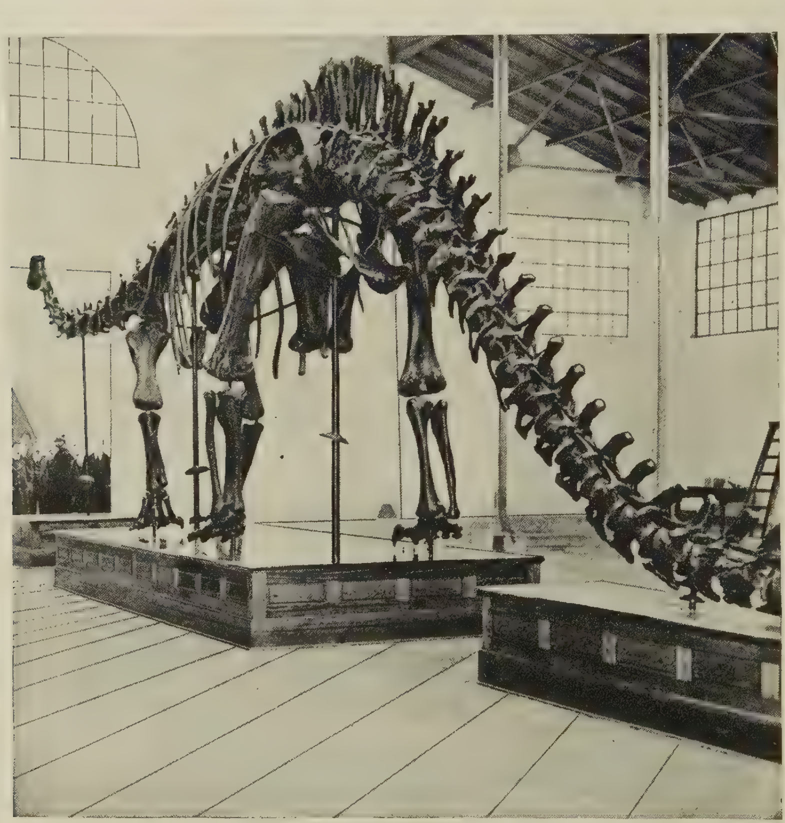
No animal works so hard for its daily food as the mole. Its whole existence is spent in constantly raising and removing large quantities of earth by sheer force of muscle. Its appetite is voracious; it works like a horse, and eats like an elephant in proportion to its size. In all its waking moments it is digging and delving and scurrying after worms in all its galleries and tunnels. Its digestive powers are remarkably rapid, and, with heart and lungs and muscles working at a furious rate, about twelve hours is the limit that it can exist without food.

Moles live in pairs, breeding in spring and sometimes in autumn, the family of young numbering five or six. The female makes a nest of dried leaves in the upper gallery or else constructs a fortress of her own. There are always fierce fights among the males when they are selecting their partners.

The mole is the greatest of all the diggers and mound builders. You can hardly undertake a more interesting bit of excavating than to dig one out and study its nest mound. There are often two stories to the mound, with many galleries and passages to the upper one and away from the lower one.

"The hillock," says a British writer, "is beaten and pressed until it is hard enough to withstand the penetration of water. Under the central arch is a small mound which is pierced with sloping holes, the entrances to hard and firm paths, twelve to fifteen paces in length, which radiate from it like the spokes of a wheel from the hub. All together it is a perfect maze, well calculated to defy pursuit even by the weasel."

I have trapped and followed hundreds of moles but never came upon one of the galleries, though our American mole is said to make them just as the English mole does, only at a greater depth below the soil.



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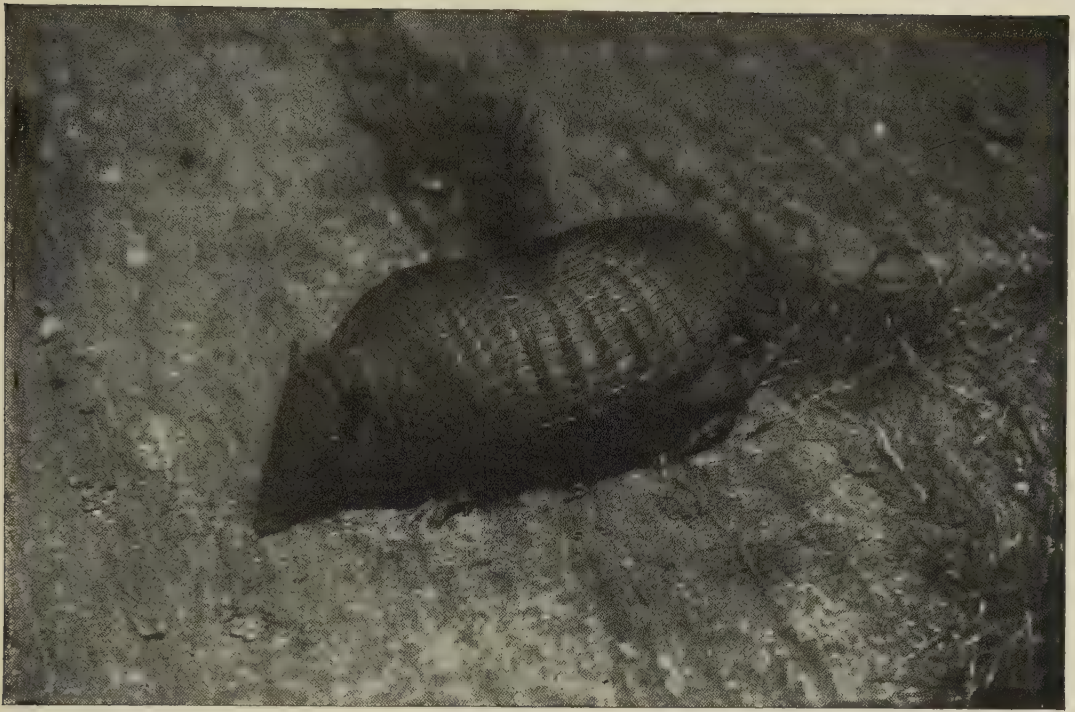
THE MONSTER DIPLODOCUS



By C. William Beebe

SIX-BANDED ARMADILLO (*Dasypus sexcinctus*)

A tropical species allied to our nine-banded armadillo, mentioned below, but with shorter ears and tail and only six rings.

Here is a problem for you to solve. Find and describe the nest mound of the American mole.

The star-nosed mole seldom troubles our gardens and lawns, because he lives in low, swampy ground about the meadows. I have often caught them when the spring freshets have flooded their burrows and driven them into the open.

But they are good swimmers, even taking to the water in their chase for beetles, sometimes coming out of their deep winter burrows and swimming about like muskrats under the ice-covered ditches.

Where do they nest? This is another problem for you to investigate and solve. For my own part, I have never seen their young or the nesting mound.

Look for the eyes of the next mole you catch — you can find them; and the ears — you *can't* find them. Yet the mole really has ears — *internal* ears, and they are extremely keen.

THE EDENTATA, OR TOOTHLESS MAMMALS

THE SLOTH AND OTHERS

YOU should have lived several millions of years ago in the United States to have seen the real American sloths and armadillos worthy of our great country. For in those days we had the huge megalonyx and the gigantic slothlike mylodon. When you visit New York City, go into the American Museum of Natural History and look up the monstrous megatherium. I have forgotten his height and what he must have weighed, but his bones look, as I remember them, as big as a house!

The only American member of this toothless race of one-time giants is the little nine-banded armadillo, which wanders across into Texas from Mexico, where it is sometimes domesticated to clear the houses of vermin.

"This is a queer world," you will hear people say. Look carefully at these armored little freaks and you will say so, too. If you could touch one and see him roll himself into an armor-clad ball that would break the teeth of a hyena to get through, you would say "queer!" again.

The "Most Queer" Sloth! If the armadillo is queer, the sloth is queerer. Armadillos, sloths, anteaters, and pangolins all belong together, are all queer folk; but the three-toed sloth with *real live* moss growing in his hair (the old mossback!), with his *nine* neck bones where other animals have only seven, with his four legs that he never uses for running or leaping or swimming or digging or walking, that moves, so to speak, on his back, that never drinks, that always hangs — I say that creature is queer!

But what a wonderful thing when you stop to think about its queer ways and the queer feet and neck, etc., that adapt it to its strange living. It *lives* — moves, rests, and *sleeps* suspended by its own feet from the under side of the tree limbs.

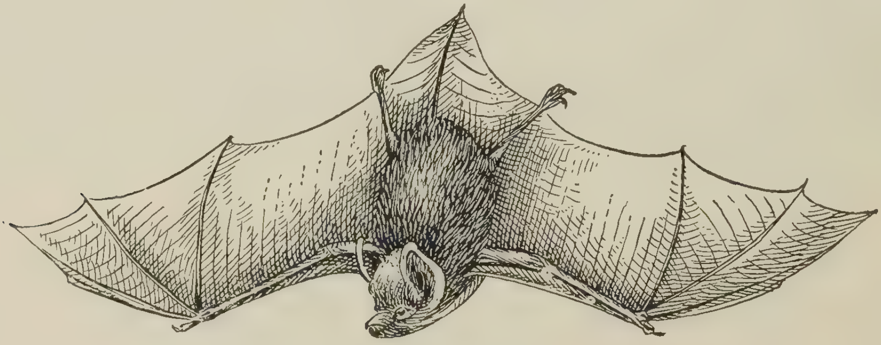
Question: Did it get its hooks of feet and its nine-boned neck by living its peculiar life, or did it have its peculiar hook and neck and so adopt this form of life? Look into that, please.

A MAMMAL WITH WINGS

"Bat, bat, come under my hat
I 'll give you a piece of bread and fat!"

IS there a child anywhere who has not skimmed his hat into the dusky air and called those old lines out at the darting bats? Perhaps in the glaring centers of our great cities there are no bats to be seen, because there is never any twilight there; but surely there can be few other places over the length and breadth of the world where bats do not flit through the gloaming, giving just a touch of weirdness to it by their leathern wings and uncanny squeaks—the thinnest, shrillest squeak in Nature it seems, so shrill and thin indeed that many people cannot detect it. Old Homer in the "Odyssey" likened it to the cry of ghosts.

The bats are true flying mammals. The arms and fingers are greatly prolonged to sustain a thin membrane used as a wing. The thumb is left free and armed with a strong claw, enabling the bat to climb walls and run upon a rough surface. It suspends itself, however, when at rest with its hind feet and hangs head down. Its molars bristle with points for crushing its insect food.



LITTLE BROWN BAT

Bats live in caves, lofts, and in the hollow of trees by day; all hibernate in the same situations, going into winter quarters in the autumn, and reappearing in the warm twilight of spring. Though the eyes are small, and the sight, so far as we know, deficient in keenness, they show wonderful skill in avoiding objects during their rapid flight. This has led some zoölogists to think that it has a sixth sense. It is probably due, however, to its extraordinary delicacy of touch, for they can fly through the densest bushes when blinded without touching a twig.

Next to my house some years ago stood an old house that was alive with bats — the beautiful "red bat," which is one of the commonest in eastern North America. I have stretched out on the grass for many a twilight and counted them, sometimes getting as many as five hundred of them, as they came out from under the eaves.

They got up under the eaves into the empty spaces beneath the shingles, and the place must have been draped with them. As they are generally infested with the common bedbug, this fact may have answered the question of that despairing housewife, "Where can the bugs come from?"

Associated with ideas of gloom, it inspires universal dread, yet all of our bats render great service by devouring noxious insects. To capture these it curves forward, that part of the membrane expanded between the hind legs and tail serving as a net. Its flight is uncertain and awkward, as ever and anon it dives downward, apparently making complete somersaults in its effort to take the "catch" from the net. The hind legs are joined by a transverse membrane which includes the tail, and this combination of legs and tail forms the framework of their scoop net.

THE GUANO MAKERS

One of the most peculiar uses to make of these curious flying creatures is the utilizing of their droppings or excrement for guano. Bats sleep in caves where caves can be found, and in the course of years deep deposits of droppings accumulate on the cavern floors. It is this that is made use of for fertilizing the soil, as bird guano is used from the bird rookeries on the rocks of the ocean.

"The guano of bats has been found in large quantities in caverns in France, Italy, and the Pyrenees," says a recent writer, "but probably the largest guano caves are those of San Antonio in Texas. By means of a shaft entrance to the cave the guano can be dug out without disturbing the sleeping bats, the number of which in the largest cave is enormous. When evening comes it is a wonderful sight to see them issue forth from the mouth of the cave in a dark stream like a moving cloud for quite two hours, with a noise of whirring wings which sounds like a gale of wind. The sight is wonderfully interesting, but the stench from the creatures is almost unbearable. The supply of guano is naturally not inexhaustible. When the guano has been taken from a cave it is closed for a period of four years, by which time there is another deposit well worth removal."

FAMILY LIFE

When quite a small boy I was one day climbing about the top of a tall oak tree, when I put my hand on something soft and hairy that chattered. Of course I snatched my hand away, to find a "little brown bat" (the bat I most frequently see in New England) hanging head down from a twig, and two little baby bats clinging to her! I gave her a little poke and off she flew, the babies hanging on for dear life as she zigzagged through the air.

They never make any nests or even attempt to fix over the crannies where they hide and where the little bats are born. These helpless things are not left at home at the mercy of foraging rats and mice. When the old bat flits off into the twilight the youngsters often go with her, clinging about her neck, swinging away over the tree tops and along the foggy waterside, while she chases the numberless little flying things of the dark.

THE GNAWERS

THE best-known order of animals, I suppose, the world over is Rodentia — the rodents or gnawing animals. Everybody — city girl to country boy — knows a mouse when he sees one, and a rat and a rabbit. As most animals are separated into these "order" groups because of their peculiar teeth, it would be well to look closely at the rodents' teeth to see what is peculiar about them.

The rodents (gnawers) lack canine teeth, but have two upper and lower incisors, fitted to gnaw bark, roots, nuts, etc. These are long, slightly curved, and deeply rooted in the jaw. The molars are generally ridged transversely, and the lower jaw moves backward and forward in mastication. Most of the order have shoulder blades, and hence rotary motion of the arms, allowing the food to be held to the mouth while gnawing. The edges of the teeth are of necessity always sharp, since the biting ends in front are protected by an intensely hard and resisting enamel, while the softer substance of the back is constantly being worn away. If one of the incisors be broken off, its opposite continues to grow, sometimes curving, in which case at length it locks the jaw and the wretched animal starves to death.

THE MISSING TOOTH

I wish you would read my story in "The Lay of the Land" called "The Missing Tooth," in which I describe the fate of a poor muskrat who lost, or who never had, one of his upper long (incisor) teeth, and as a result died of starvation while the meadow was green with good grass.

The opposite tooth on the lower jaw, thus unopposed by lack of the opposite upper one and so unworn, had grown beyond its normal height up into the empty tooth socket above, then on, turning outward and piercing the cheek bone in front of the eye; hence, curving like a boar's tusk, it had slowly closed the jaws and locked them, rigid, set, as fixed as jaws of stone. At first the animal had been able to gnaw; but somewhat later, as the tooth curved through the bones of the face and gradually tightened the jaws, the creature got less and less to eat, until, one day, creeping out of the burrow for food, the poor thing was unable to get back.

There are ten families of American rodents — rabbits and hares, conies, porcupines, gophers, pocket mice, jumping mice, rats and common mice, sewellels, beavers, and squirrels and marmots. These range in size from the beaver to the house mouse; some are burrowers, as the gophers and marmots; others are terrestrial, as the rabbits; still others, like the muskrats, are aquatic, while the flying squirrel is even able to launch himself through the air. These different habits naturally produce great differences in form of body, but no matter what individual peculiarities a rodent may possess, the characteristic "gnawing teeth" remain the same in all.

Among the several sorts of rabbits common to Europe and America, I suppose that most of us know best the little cottontail. He is the familiar friend of my boyhood, and often, I am sorry to say, I have trapped him and snared him and shot him in the rabbity fields of New Jersey. And here he is in my small Massachusetts fields just the same.

THE RABBIT'S NEST

But here the mother rabbit digs a hole in the ground for her winter home and for her young, as the English rabbit does, while farther south she scoops out a little hollow in the earth and squats there summer and winter, and in such a place as this also cradles her young.

The nest is lined with fur pulled from the mother's breast.

"You would think that it might give her a great deal of pain to pull out her fur in this way, for you know how it would hurt you if anybody were to pull out handfuls of your hair! But rabbits molt, from time to time, just as birds do, and the fur which she pulls out from her breast is only the loose fur which would soon have fallen off in any case, because of the new coat which is sprouting up beneath it.

"There are generally seven or eight little ones in a rabbit's family, and when they are first born they are quite blind, and have no fur at all. But they grow very quickly, and it is never very long before they are able to leave the burrow and run about by themselves. They are most playful little animals, and if you lie down on the ground near the hole of an English rabbit's nest, and then keep perfectly still for a few minutes, you may see them frisking about together just like so many puppies or kittens. But at the very slightest alarm one of them will give two or three taps on the ground with its hind feet. This is a danger call which all the others understand. And in a moment you will see the sudden gleam of ever so many white tails, and back the little creatures will scamper into their burrows. But if you remain quite still they will soon get over their fright. First one little head will be poked out, and then another, and then another. And before long they will all be gamboling about as before."[1]

The Jack Rabbit. All through the great Western states, especially on the prairies and sagebrush plains, is found the long-eared,

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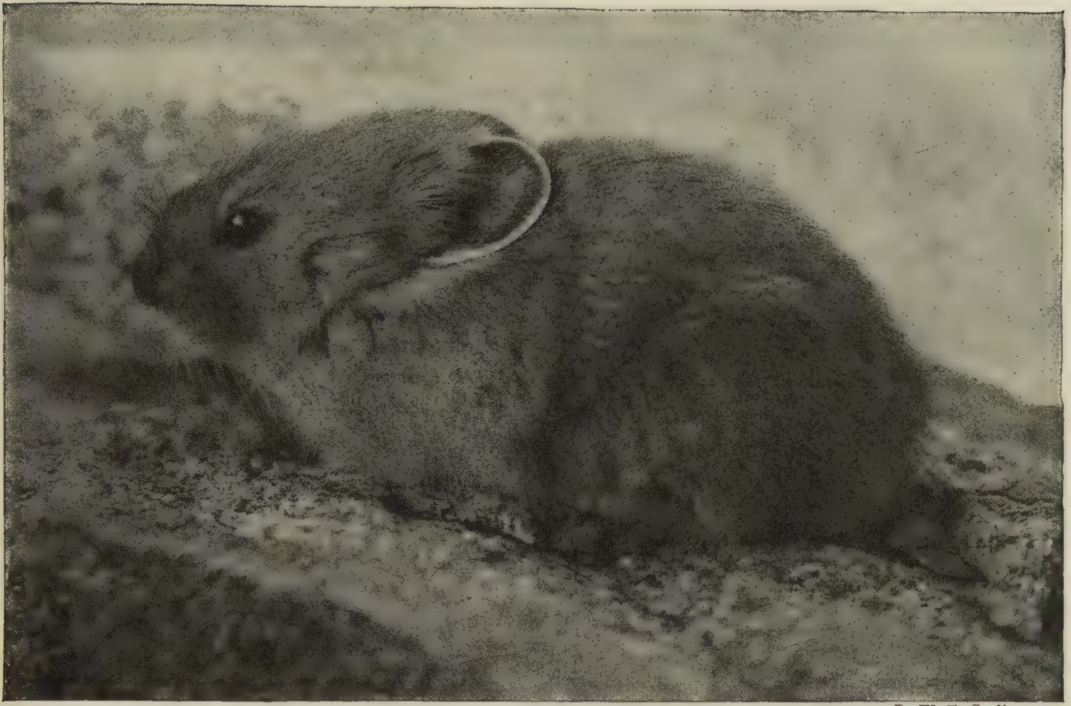
[1] "Dwellers Underground," by Rev. Theodore Wood.



By W. E. Carlin

LITTLE CHIEF HARE (*Ochotona princeps*), OR CONY

By A. R. Dugmore

YOUNG COTTONTAIL (*Lepus floridanus mallurus*) AMONG THE CABBAGES long-legged jack rabbit. Distances are tremendous in that Western country, but Jack was given legs that make short work of mere miles of space. I have raced him over a flat, hard alkali plain in a high-powered automobile going sixty miles an hour, and the bouncing, bounding, flying bunches of fur kicked the dust into my face all the way. I should hate to ride in the car that would catch one, especially over the roadless plains.

And how they thrive! I was present at one neighborhood a few weeks after a "drive" in which men, women, and children in a long V-shaped line beat the sagebrush and drove the jacks into a wired pen and killed twenty-six hundred, and yet they seemed as thick in the brush as ever. So thick were they indeed that they had chewed up acres and acres of grain in the irrigated fields of the neighborhood.

Here in the sage, too, lived the very tiny, very rare "sagebrush rabbit." Another common rabbit is the hare, a large fellow, who turns white in winter, that you will see hanging up in markets; and besides these the arctic hare of the extreme north, a snow-white creature, that can scarcely be seen in a photograph, so completely does it blend with the white of the snow. In the southern United States is a marsh or swamp rabbit that seems half inclined to turn muskrat and take to the water for a living.

The "Little Chief Hare" or Cony. Perhaps only a few of you will ever get a chance to see the pika or cony or tailless rabbit in his own home rock slide. I have been in the woods all my life, but it was not until a recent summer that I saw my first (and only) wild-life cony.

But no wonder. The little creature inhabits the loftiest mountain tops of the Rocky Mountain range, and even when you climb to his heights you run very little chance of seeing him.

We were threading our slow way along the narrow divide on the Joseph Mountains that run between the branches of the Snake River and the Imnaha. Our guide was a former "sheep tender," one who carries provisions to the shepherds in the mountains. As we were stopping a moment to breathe our horses and look down upon the head springs of Big Sheep and Salt Lick creeks on one side, and the narrow ribbon of the Imnaha on the other, this guide and our collector rode on ahead. An hour later I saw them rounding the breast of a peak and disappear. That night in camp they brought in a cony or pika or little chief hare.

The year before this camp tender, in passing a certain rock slide in the highest peaks of the pass, had heard and seen a peculiar little animal about the size and shape of a small guinea pig whistling among the broken rock. It was this slide that he now took our naturalist to, and sure enough, they brought back from it one of the rarest of American mammals.

I was broken-hearted. That I should have been so near and missed it! For we had descended two thousand feet to camp that night, and there were no cony slides below us on the trail.

While the men were busy about camp the next morning I slipped off alone on foot, and following the trail got back about ten o'clock to the rock slide where they had killed the cony.

A wilder, barrener, more desolate land of crags and slides I never beheld. Eternal silence seemed to wrap it round. The slide was of broken pieces of rock, just as if the bricks from two immense chimneys had cracked off and rolled down into the valley of the roof between. Stunted vegetation grew around, with scraggly wild grass and a few snow-line flowers, for we were on the snow line, having crossed several melting banks that day.

I sat down, hidden from sight, and watched the slide. Soon I heard a shrill, bleating whistle, not unlike the ground squirrels and marmots that I had heard all through the mountains, yet more tremulous and not so piercing.

I waited. Presently a little, long, gray form crept over a stone, stopped and whistled, then disappeared. It was my cony! I feared that I might not see one, for all my pains, in the broad light of midday; but here he was — for me! No, not for me. Because as I watched for more than an hour, as he ran from one end of that long rock slide to the other, I made up my mind that this little fellow was the mate to the one that had been shot the night before.

Up and down, in and out, bleating piteously, he ran, calling, calling, calling, but getting no answer back. It was the only one that showed itself, the only live one I have ever seen, but I followed this one with my eye and with the field glasses as it went searching and crying over the steep rock slide until long past noon — with a whole camp down the cañon looking for me!

Higher up than the mountain sheep or goat lives this little member of the rabbit family. He is the highest-dwelling mammal in the world.

"As for the stork," says the Bible, "the fir trees are her house. The high mountains are for the wild goats. The rocks are a refuge for the conies."

True enough, and it is one of the wonders that I cannot get used to, how every portion of the earth's surface has its particular life — even the blasted, barren rock slides in the gullies of the peaks at the top of the world!

The Porcupine. In all the years that I have been in the woods I have never met a live porcupine. I think if I did meet one that I should run — harmless, stupid, slow-footed beast that he is. But how fearful he looks! And how fearful he is to handle! Indeed, he is more than a match for the big-footed lynx and the red-toothed wolverine.

The most dangerous of his enemies is the fisher, who manages when desperate to seize him by the throat, where he is least protected by his quills.

The big cats of the northern woods, when forced to, will also hunt porcupine, though it is often a fatal choice for them. The porcupine's quills are fitted with numberless little barbs that, once the quill penetrates the skin, keep forcing it deeper and deeper into the flesh with every twinge of his muscles, until a vital part is stabbed. Many a porcupine has avenged his own death weeks after he has been eaten, even the fisher occasionally being killed in this manner.

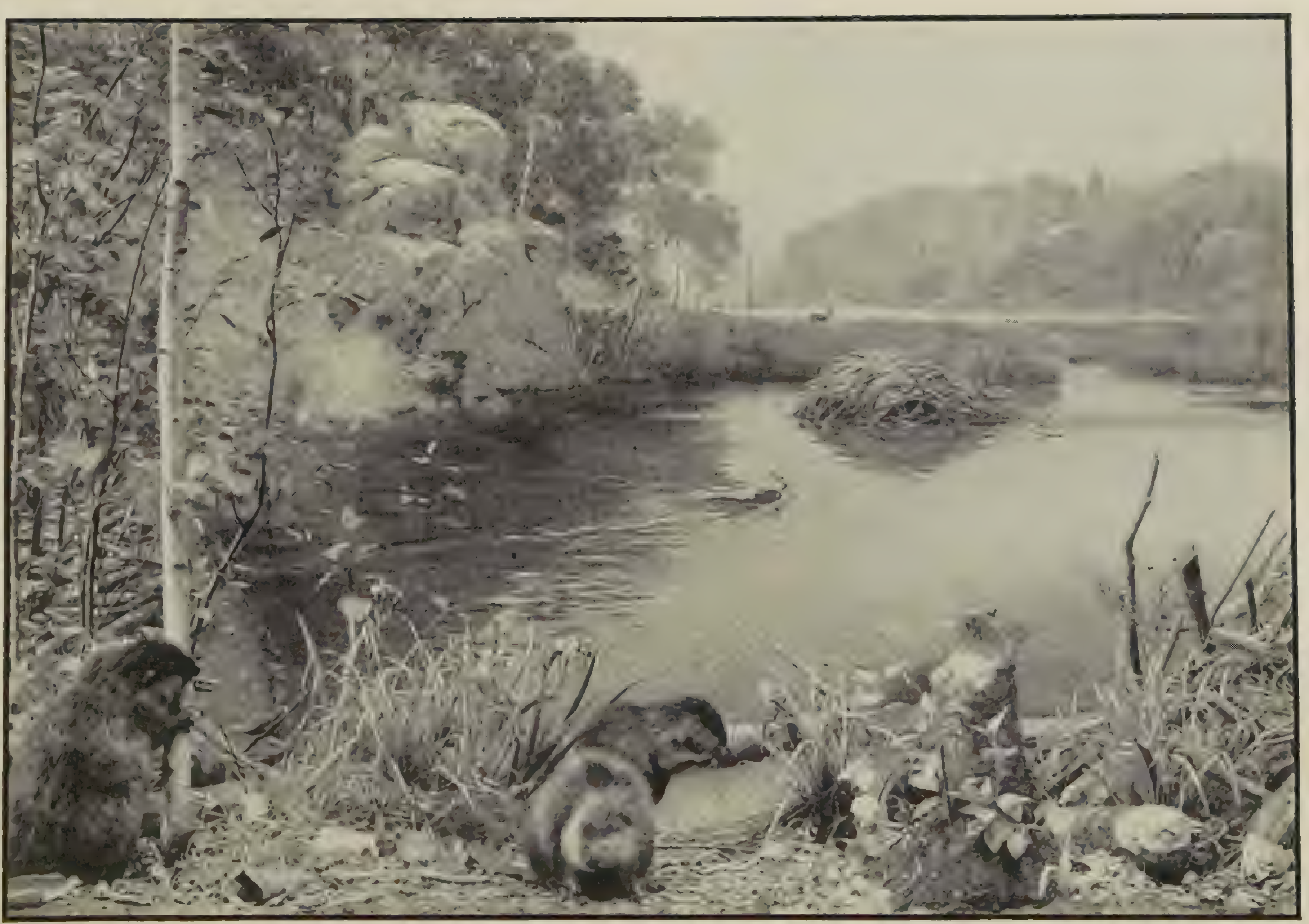
The porcupine lives in a hollow log or cavern among the rocks, where he can sleep in comparative safety curled up with his spiny back to the entrance.

During the coldest days he sleeps, but crawls out at every thaw and hauls himself into the tree tops, where he stuffs himself with green bark, often killing the tree. He goes freely about by day, clad in dreadnaught armor, man being his worst enemy. A pair of twins born in the spring make up the family of this queerest of rodents. Read the story of "Porky" in "Forest Neighbors" by Hulbert.

"A SLOW-WITTED, HOMELY OLD 'PORKY'"

The Beaver. If "Porky" is the queerest, the beaver is the most interesting and intelligent of the gnawers. You will want to read Mr. Enos R. Mills's book on the beaver. Along the sides of the wild Imnaha River in the Rockies I saw some fresh work of beavers, cottonwoods felled that were as large around as my body. Then they were patiently cut and dragged out to back up the rushing water of that plunging stream, the whole engineering feat almost human in its conception and execution.

"The beaver closely resembles the common muskrat in general appearance but is several times as large and has a tail flattened horizontally instead of vertically. He is found throughout the mountainous Western states, and more rarely in the wilder regions of the East. In the vast solitude he plies his busy trade, cutting trees of all sizes with his marvelously sharp, chisel-like teeth, building dams



Field Museum of Natural History, Chicago

BEAVERS AND THEIR WORK

Note the stump of the large tree that was felled by the beavers; also the beaver swimming with a branch to their "house" in the water.

across streams and erecting great 'houses' of tree trunks and branches, in the interior of which he lives in cozy warmth during the severe winter. The remarkable intelligence displayed by the animals in felling the trees in convenient locations and dragging them into proper position, and the wonderful manner in which the upper sides of the dams are plastered, seems little short of impossible to the reader who has not seen this wonderful work.

"In regions where beavers are especially abundant, the topography of entire valleys is sometimes changed by the construction of numerous dams, the consequent backing up of the water, and the depositing of the sediment brought down into the still water by the rushing torrent. All through the valleys of the West are tracts of rich, black earth known as 'beaver-dam soil.'

"The beavers not only cut down trees for the purpose of making dams, but they also use the smaller upper branches as a storage supply of food, anchoring them under water for the winter's use."

"In order to cut down a tree," says Mr. Stone,[1] "they gnaw deep parallel grooves around the trunk and then rip out the wood left between these grooves in large chips, their broad teeth splitting them out like a carpenter's chisel. Other grooves are then cut still deeper into the tree and the chips split out from between them as before, and so the work goes on until the tree trembles and lurches slightly in the direction of the deepest cut, hangs canting in air for an instant while the last tough fibers hold, and then, slowly at first, swings over and comes smashing to the ground.

"Although beavers usually gnaw all around a tree, it has frequently been stated on the very best authority that it is their rule to cut deepest next the water in order that the trunk may fall in that direction and so lessen the distance it will have to be dragged.

"But others claim that they gnaw in equally on all sides and let the tree fall where it will, or lodge hopelessly tangled among its neighbors.

"The dam is made of these short logs and trunks wattled together and filled in with stones and earth, the whole cunningly bent against the current to withstand the pressure of the water.

"It is frequently reënforced by other dams just below, that back up the water against the first and relieve it of a part of the pressure.

"As the water rises the beavers watch the shores carefully, and every depression in the bank likely to lead the water off to one side is promptly dammed and the pond at last brought to the desired level."

This truly remarkable animal, so interesting in its habits and so valuable for its fur, is, like so many others, on the road to extinction. The hunter pursues it to the most remote fastnesses. No place is too far, too wild, for the fur trapper. One would find it hard to get into a more remote region than the rocky gorges of the Joseph Mountains, but the trapper had been there before us. Here were the cut trees, the lanes of wattled trunks and limbs, but the beavers, in spite of rigorous laws, were gone — into the fur trappers' pile of skins.

According to Mr. Stone, a new colony is started by young ones going off in pairs accompanied by the old ones. The time chosen for the pilgrimage is in the early part of the fall, while the streams are still low and food abundant.

"The little party explores together every promising stream and watercourse, until a suitable location is discovered for the new pond, when they all set to work, old and young together; and it is not until the dam is completed and the new cabin raised with a good supply of green wood beside it, that the old beavers go back to their own pond, to attend to the regular fall work of repairing the old dam and cabin and cutting and hauling their winter's wood down to the water, and then settle down to the dull routine and humdrum life of a beaver's winter."

The Woodchuck.[2] I am sorry for anybody who has n't a woodchuck on his premises, and sorry for anybody who has. It is dreadful to think of the cabbage heads an old fat gourmand woodchuck can stuff into his baggy hide in a single night. Some summers my garden is totally lacking lettuce, cabbage, cauliflower, and celery because about six old

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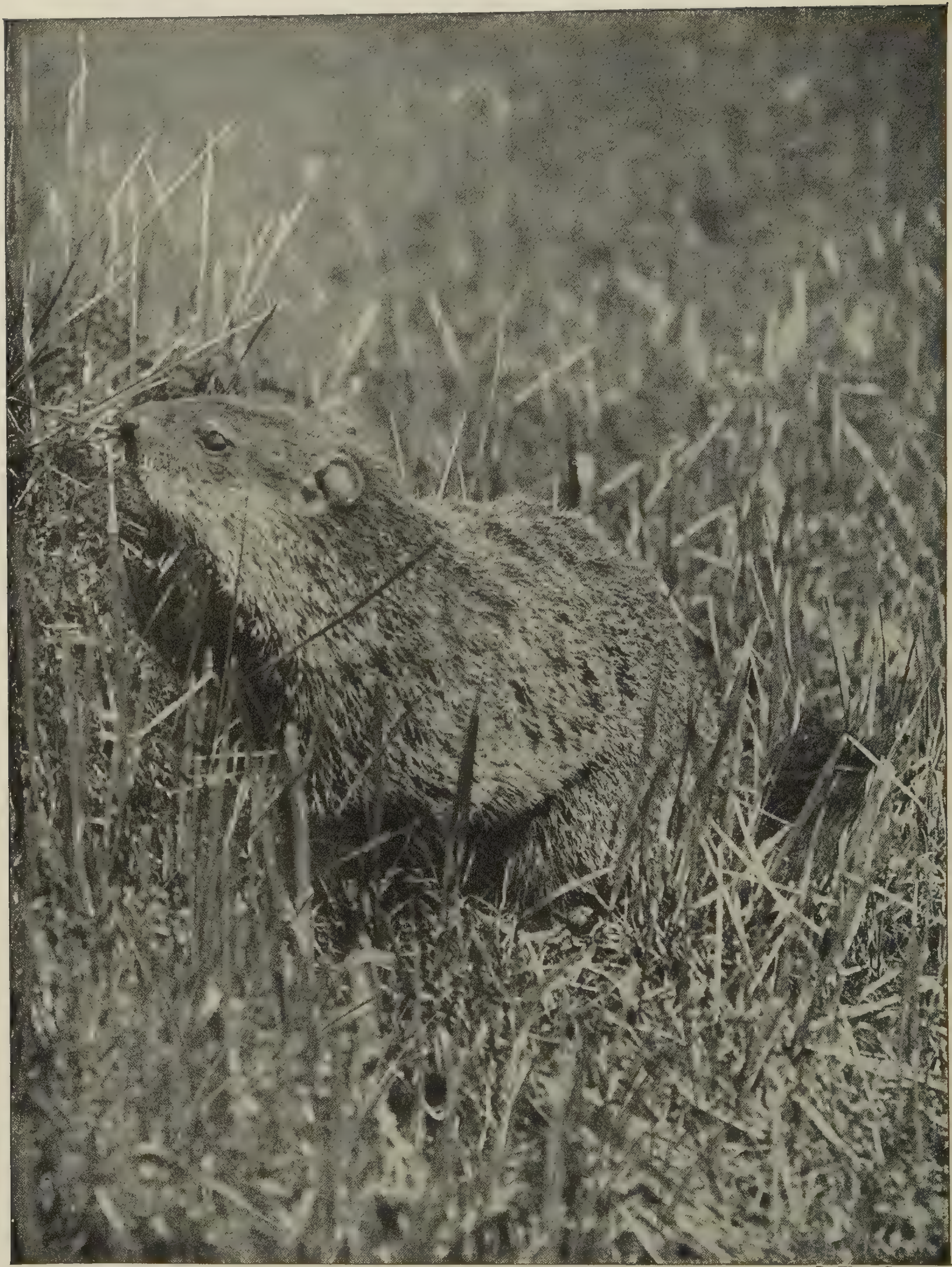
[1] In "American Animals." Published by Doubleday, Page & Co.

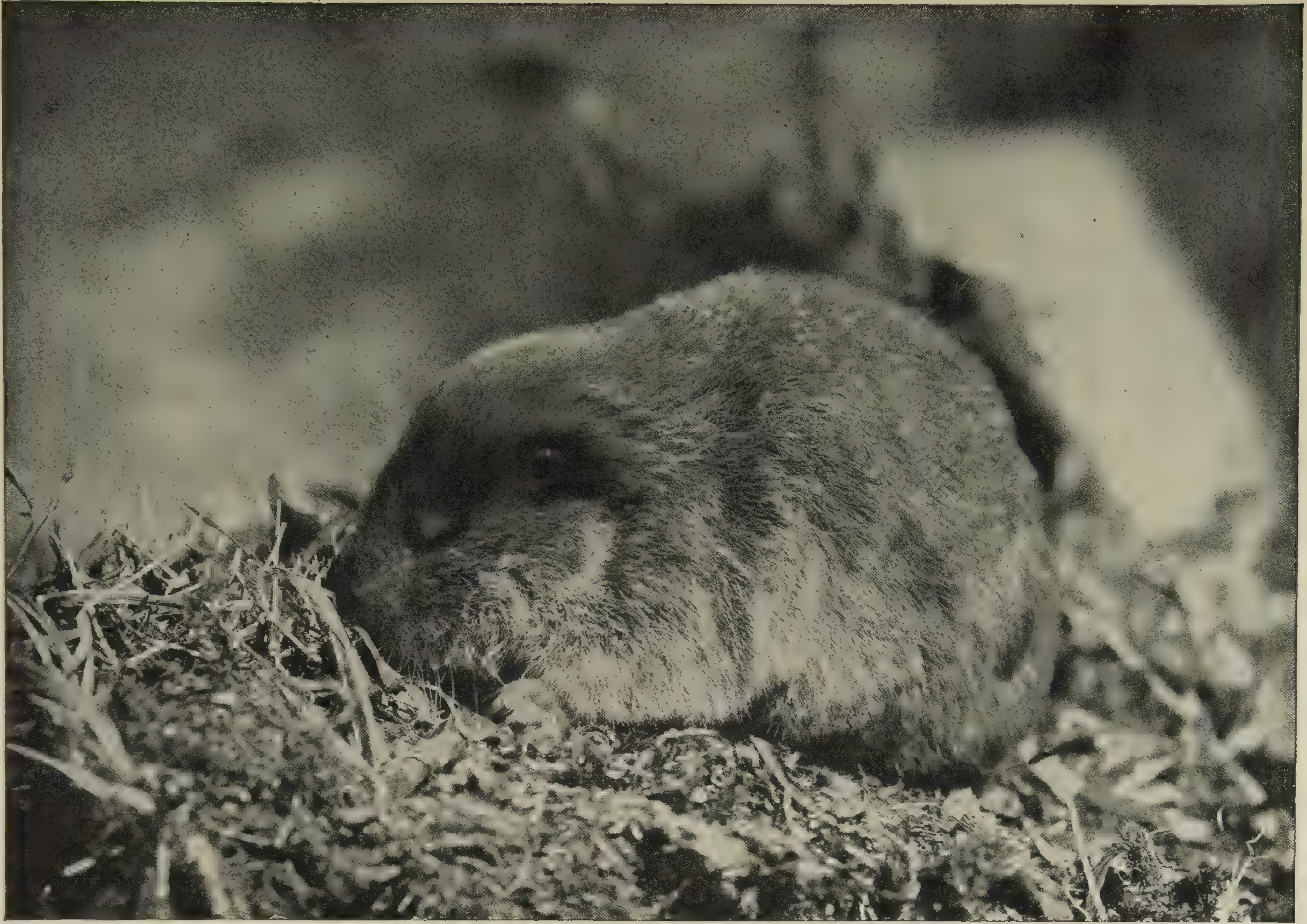
[2] Adapted from "Wild Life near Home."



By W. E. Carlin

THE WOODCHUCK (*Arctomys monax*)

"Fat, obstinate, lazy, defiant, tough, flabby, placid — withal, a nuisance!"



By *W. E. Carlin*

THE WESTERN POCKET GOPHER (*Thomomys*)

Note its molelike build, big hands and short ears, all adapted for an underground, burrowing life. Photographed after his pursuers had dug sixty-seven feet along his tunnel to catch up with him.

woodchucks descend upon it daily and devour whatever is green. Potatoes, tomatoes, asparagus, and some other things they let alone, while the meadow right beside the garden is juicy with grass. Kill them? Yes, but did you ever try it? Ever try to kill *them?*

I got a gun once and waited — waited — and waited. Did you ever wait with a gun until a woodchuck came out of his hole? *I never did.* A woodchuck has just sense enough to go into his hole — and stay in.

There are too many woodchucks about and my days are too precious for me to spend any considerable part of my summer watching with a gun for *one.* Besides, I have been known to fire and miss a woodchuck, anyway. It is easier not to set out the celery. You can buy fairly good celery in the stores.

Stop up his hole? I have tried that too.

I have tried shutting him out; I have tried shutting him in. It was cruel. I was ashamed of myself for doing it, and went back really hoping to find his burrow open. And I did find it open.

Never again will I worry over an imprisoned woodchuck; but then I shall never again try to destroy a woodchuck by walling up his hole, any more than Br'er Fox would try to punish the rabbit by slinging him a second time into the brier patch. The lazy, logy old scamp!

"If, as seems probable, the woodchuck really sleeps all winter long, then his waking hours occupy an extremely small portion of his life, for during the entire summer he spends the greater part of his time in his hole, and as he never takes his meals there, it is hard to imagine how he can occupy himself at such times except in sleeping. He is, perhaps, the least industrious animal in existence except when engaged in digging his hole, when he works away at a tremendous rate until it is finished; but once it is completed, he seldom attempts to enlarge or remodel it in any way, but spends his days in luxurious ease, coming out to get his breakfast soon after sunrise, while the dew is still on the grass, at which time I fancy he makes his most substantial meal, though he may occasionally be seen feeding at any time of day. At noon he is pretty sure to make his appearance above ground for luncheon, but apparently spends more time then in sunning himself than in eating. Late in the afternoon he again shows himself, and feeds until nearly sunset, when he descends into his burrow for the night. It is not often that he is obliged to go many steps from his doorway in order to fill himself, and by autumn he has usually reached a perfectly ludicrous state of obesity."[1]

Chucky is fat, obstinate, lazy, sleepy, defiant, tough, flabby, placid, and, withal, a nuisance. Yet it is fun to think how he gets ahead of me, of the dogs, foxes, and other enemies, and persists in digging his hole here in my very dooryard. Long life to you, Chucky, and may your tough-hided offspring thrive to the end of time in these stony New England pastures, even if you do destroy more uncut sauerkraut in a summer than all of the Fatherland together in the winter!

But as for his powers as a weather prophet — go to! I believe in them as I do in those of the Old Farmer's Almanac or those in Washington.

According to an old folklore story, if a person wishes to know whether there will be a late or early spring the woodchuck is the one to be consulted.

Early in the autumn the woodchuck goes to sleep in his winter quarters. He curls himself up in a little ball, with his nose under his paws so that he can keep his toes warm by breathing on them. Here he sleeps snugly all winter, and then, so the story goes, he wakes up suddenly on February 2, stretches himself, rubs his eyes, and at last creeps out of his cozy nest to see what it looks like outdoors. If he finds it cold and wet, the earth covered with snow, and heavy gray clouds hanging low in the sky, he begins to look around, for he feels certain that soon the ground will be warm and the little buds will be coming out, for Spring is surely on her way. But if the sun is shining brightly and the first thing he sees as he leaves his burrow is his own shadow, he pops back into it again as fast as he can, once more tucks his nose under his paws, and settles down for another six weeks' nap, for a cold, late season is the only result that can be expected from seeing

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[1] From "American Animals.

By E. D. Warren

YOUNG PRAIRIE DOG (*Cynomys ludovicianus*)

The animal shown here is about one third its full growth. The adult is smaller than a woodchuck but somewhat larger than a gray squirrel.

his own little shadow cast by the bright sunlight. It must be confessed that he does n't always get it just right, but he probably does n't mind if he does oversleep some fine spring days.

The Prairie Dogs. The true prairie dog, *Cynomys ludovicianus*, is about fifteen inches long, with short hair, short ears, very short tail, of a brownish-gray color, and is found from Texas to Kansas to the base of the Rocky Mountains, north to Montana. He is the woodchuck of the high, dry prairies.

"A prairie-dog settlement in Colorado is estimated to contain five hundred million inhabitants. Were the snakes, owls, rabbits, lizards, and horned toads which live with the dogs to be counted in, the population of the place would reach the billion mark.

"The figures are not strictly accurate, for the government has never counted these dogs in the census. But anyone who has seen such a city knows there are over one hundred dogs to the acre, and this city is one hundred and forty miles long by fifty wide, containing 4,480,000 acres.

"They dig deep burrows, with so many chambers that the railroad which is being put through their city will have to destroy a large number of dogs and their homes in order to avoid accidents from caving in of tracks.

"This city was founded centuries ago. It has been known to be about its present size for fifty years. Families grow rapidly, and the young ones stay at home till there is not room enough for all and some are pushed out.

"They live on four kinds of food—cactus, roots of wire grass, tender green shoots of sagebrush, and greasewood. These are the only specimens of plant life found in the Western deserts where prairie dogs are native. In spite of the sameness of their fare, they manage to keep sleek and fat on food which a ground squirrel would consider starvation diet."[1]

Burrowing owls and rattlesnakes do *not* board with Mrs. Marmot at her invitation.

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[1] "Our Dumb Animals."

Owls eat young prairie dogs, and if you find the owl in a prairie-dog burrow he came there by force.

Gophers, Wild Mice, Rats, and Lemmings. We cannot stop long here with this numerous family of rodents, for we already know too much of some of them. Yet there is hardly a more fascinating family of animals alive. I once had the pleasure of trapping with a trained "mammal man" of the Smithsonian Institution, when we caught gophers, sage rats, kangaroo rats, pouched mice, and a dozen others new to me, and I must say that a herd of bison on the prairie could not have been so interesting as the hidden ways of these tiny wild folk.

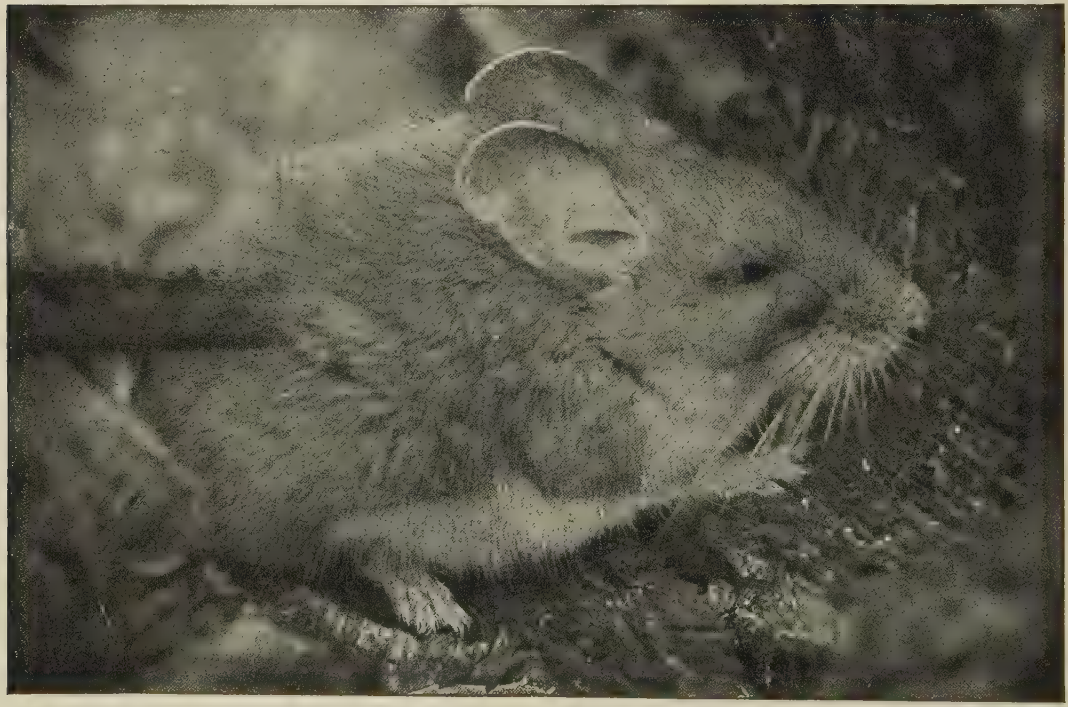
After our rabbits, conies, and porcupines come the gophers and pocket mice, jumping mice and rats and ordinary mice.

The Gophers. The gopher is about ten inches long and is a burrower rarely or never seen above the ground. It is like a little muskrat in general appearance, and one species or another is found from Georgia west to North Dakota.

Doctor Goode describes their digging habits as follows: "They dig by grubbing with the nose and a rapid shoveling with the long curved fore paws assisted by the pushing of the hind feet, which removes the earth from beneath the body and propels it back with great power a distance of eight or ten inches. When a small quantity of earth has accumulated in the rear of the miner, around he whirls with a vigorous flirt of the tail and, joining his fore paws before his nose, he transmutes himself into a sort of wheelbarrow, pushing the dirt before him to a convenient distance."

Pocket Mice and Kangaroo Rats. The pocket mice are all Western and live especially in the dry regions. Here too dwell the long-legged kangaroo rats, that look like the jerboas of the Old World.

We caught them on the sagebrush plains and the pouched mice away up on the mountains, but such shy, timorous, nocturnal little creatures



WHITE-FOOTED OR DEER MOUSE (*Peromyscus leucopus*)

This beautiful little mouse of the woods is fawn-colored above and white below.

By C. William Beebe

THE COMMON OR NORWAY RAT (*Mus norvegicus*): AN UNMITIGATED PEST

it was impossible to watch on the move, as we were with a new camp each night. But Mr. Thompson Seton has stayed long enough to see them and draw them too with pencil and pen. He writes:

"Just the loveliest, daintiest, fawn-brown little creature that I had ever seen in fur — large, beautiful eyes like a fawn's — no! not like a fawn's, for no fawn that ever lived had such wonderfully innocent orbs of liquid brown, ears like thinnest shells of the sea, showing the pink veins' flood of life. His hind feet were large and strong; but his fore feet — his hands, I mean, were the tiniest of the tiny — pinky white, and rounded and dimpled, just like a baby's, only whiter and smaller than the tip of a baby's finger. His throat and breast were snowy white — however does he keep himself so sweetly clean in such a land of mud! Down the outside of his brown velvet knickerbockers was the cutest little silvery white stripe, just like that on a trooper's breeches. His tail, the train that I suppose the page carried in dancing, was remarkably long, and was decorated to match the breeches with two long white stripes and ended in a feather duster, which was very pretty, but rather overdone, I thought, until I found out that it was designed for several important purposes.

"His movements were just like what one might have expected from such an elegant creature. He had touched my heart before I had seen anything but his tracks, and now he won it wholly at the first meeting."[1]

Our North American jumping mouse (*Zapus hudsonias*) lives in the fields and woods. Along in the latter part of the summer, this mouse weaves a globular nest of grass blades, which he and his mate occupy until cold weather approaches. The pair then find some deep cranny among the rocks, or else dig a little cavity in the ground. Here, in their snug bed of leaves and soft bark, they go into hibernation with the first severe frost, and sleep until the warm days of May. No other mammal sleeps so soundly. No other of our mammals is so deep a winter sleeper. I have plowed them out in April so sound asleep that I could carry them home in my pocket without waking them up.

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[1] From "Lives of the Hunted." Published by Charles Scribner's Sons.

True Rats and Mice and Lemmings. The Family Muridæ. To this family belong *one quarter* of all the North American quadrupeds — the house mouse and the barn rat (Norway rat) being the two best known and most hated. The mice and rats can be divided into two very natural groups, which we might term the short-tailed and long-tailed groups.

The former are thickset, short-legged, and short-eared, with a very short tail, small eyes, and thick fur. All of which characters stamp them as burrowing animals.

The long-tailed group, on the other hand, are sleek and graceful, standing higher on their legs, with usually large ears, big eyes, and a long, slender tail — our common mice.

Among all these little lemmings and mice the most interesting to us are the common ones of our woods and fields — the bob-tailed meadow mouse (or vole) whose nest we find in cutting the meadow hay, whose paths in the snow we see all winter long, and whose nest we sometimes come upon in the dead of winter in beet pits down below the frost line, with little naked babies in them.

Its body is thick and compact, legs short, ears very short. It is dark brown above, with a general admixture of black hairs, shading gradually into gray on the under surface, and has a very short tail.

The White-footed Mice. When a boy, I used to catch the little red-backed mice of the cranberry bogs, but I never see them in the cold, wet swales of New England.

If I set a mouse trap in the woods here I catch only white-footed or "deer" mice, the most beautiful of our little mammals, I think. They are brownish-fawn color above, brightest on the sides and darkest on the back, where there is a considerable sprinkling of black hairs. Below white, tail dusky above, light beneath, feet white.

But it is particularly lovely in the winter, when its fur is thick and long and bright golden-fawn color and white in almost equal parts. The white fur, which is literally whiter than ermine, covers the entire under surface and reaches well up on the flanks and shoulders, the line of separation being clear-cut and as straight as is possible from the tip of the nose to the tip of the tail.

The white-footed mouse has eyes like those of a flying squirrel, very large and prominent and perfectly black, in brilliant contrast to the surrounding fur.

I have told the story of one that got into my cellar one winter and insisted upon storing about a pint of hickory nuts in the toe of one of my tall hunting boots, though I dumped them out on the cellar floor day after day, and how finally she took the nuts away off into the attic and stored them in the bottom of a deep empty water tank out of which evidently she could get them.

One spring, in looking over my bees, I found a nest beneath one of the hives in which were two full-grown white-footed mice *dead* — they had died in their sleep together somehow, though not a hair was disturbed upon their beautiful bodies.

"Every woodchuck's burrow forsaken by its original owner and not yet appropriated by some other dweller of the woodland," says Mr. Stone, "makes a winter home for several families of wood mice, who are all the better pleased if the entrance has become partially closed and blocked up by the trampling feet of cattle, and the slower yet more effective work of frost and rain and melting snow. The rest of the burrow remains open and unobstructed for years, one hundred feet or more of warm, dry subway, with its chamber stuffed with soft grass for the mice to curl up in as they please.

"Yet these little, tender, round-bodied, white-footed mice in no way fear the cold; on the bitterest nights of winter when the thickset stars seem close down among the tree tops, and the frozen wind hisses through the stiff branches and the dry snow is piled high around the stems of the pines, they are still out in the wind in numbers, skipping along the snow from tree to tree."

The Little Lemming. A northern relative of the bob-tailed meadow mouse is the pied lemming of Labrador and the arctic circle. In the summer it is gray above, more or less dappled with rusty-red and with a black line down the back; below it is dull-gray, tinged with rusty-red. In the winter it is nearly pure white. The most extraordinary peculiarity of this animal is the enormous development of the nails on the two middle toes of the front feet in the winter, to help them with their incessant digging.

Our lemming is just as truly the lemming of Scandinavia, but is not so celebrated, because its habits are not so well known. It is about three inches long, with small ears and a short tail, a striped, triangular face, and strong digging claws. It has beadlike eyes that seem always "to notice objects above them rather than those in any other direction." During the summer they nest under stones, and in winter dig long galleries through the turf and under the snow in search of their vegetable food.

"In England," writes Crotch, in the "Popular Science Review," "we fail to perceive how much active life goes on beneath the snow, which in more northern latitudes forms a warm roof to numerous birds, quadrupeds, and land insects, which are thus enabled to secure an otherwise impossible sustenance. At the same time . . . a fearful struggle for existence is carried on during the long autumnal nights before the snow has become a protection rather than a new source of danger to all save predaceous animals."

The Lemming Migrations. Every few years, because of scarcity of food no doubt, the lemmings of the barren mountains descend in millions, marching, strangely enough, straight away for the sea. Thomas Pennant a century ago thus described them on the road:

"They descend from the Kolen (Mountains), marching in parallel lines three feet apart; they traverse Nordland and Finmark, cross lakes and rivers, and gnaw through hay and corn stacks rather than go around. They infect the ground, and the cattle perish which taste of the grass they have touched; nothing stops them, neither fire, torrents, lakes, nor morasses. The greatest rock gives them but a slight check; they go round it, and then resume their march directly without the least division. If they meet a peasant they persist in their course, and jump as high as his knees in

Photographed by Cora June Sheppard for the Author

A BIG MUSKRAT LODGE

THE MUSKRAT (*Fiber zibethicus*)

The house builder of our ponds and river meadows.

defense of their progress. They are so fierce as to lay hold of a stick and suffer themselves to be swung about before they quit their hold. If struck they turn about and bite, and will make a noise like a dog. Foxes, lynxes, and ermines follow them in great numbers, and at length they perish, either through want of food, or by destroying one another, or in some great water or in the sea. They are the dread of the country, and in former times spiritual weapons were exerted against them; the priest exorcised them, and had a long form of prayer to arrest the evil."

What a story! and a tiny mouse story at that! Who will thus tell us the story of our own arctic lemming? Will you?

The Muskrat. Before I was eight years old I helped earn our first big Webster's Dictionary by trapping muskrats. The vast marshes of Maurice River were alive with them, and we used to get the vast sum of five cents for a well-cured hide! So it is perfectly natural that I should still have a great interest in this overgrown meadow vole, for that is about what the muskrat is. For an account of how we used to hunt them and how they live read my story in "Wild Life near Home" called "Mus'rattin'," and the chapter in "The Lay of the Land" called "The Muskrats are Building."

The muskrat is not so much mouse as it is a little cousin of the beaver. But while the beaver is wild and retiring, fearing the advance of man along the quiet forest streams, the muskrat has learned to profit by the settlement of the country and the consequent thinning of his natural enemies, and, though hunted and trapped persistently for several months in the year, still refuses to be driven away.

To the lover of the wilds there is a fine opportunity in the muskrat for a study of wild animal life, for its fearlessness and frank habits make it easy to observe. Its life in the ditches, its winter life in the lodges, its foods and wanderings all make it one of the creatures that every person should know.

The muskrat is a massively built animal, with the head and body attaining a length of about a foot, and the tail, nearly naked and covered with scales, about ten inches. The feet, which are partially webbed, differ from those of the voles in having their soles entirely naked.

Muskrats are thoroughly aquatic, living in ponds, swamps, and sluggish streams. Although their food consists mainly of the roots of grasses and water plants, they consume considerable quantities of river mussels; they will likewise catch and eat fish, while they are said at times to devour the flesh of such individuals of their own species as they may find dead, or wounded and helpless. Occasionally they wander considerable distances from the water, and I have tracked them through the snow more than a mile from their homes where, impelled by curiosity, they have wandered into the dooryard at the risk of their lives.

The Long-tailed Rats and Mice. But to come back to the long-tailed mice and rats — we have, besides the white-footed mouse and the house mouse, the cotton rat of the South and the Western wood rat as the best known, the latter common in every camp. They have kept me awake many a night, helping themselves to our camp provisions.

Of all the animal pests, the Norway rat, introduced here from Europe, is the most grewsome and destructive.

"Various authorities working for our government have reported as a minimum estimate that the rat causes an annual loss in this country of no less than one hundred million dollars," is the startling statement of W. F. Cooper in the "Technical World Magazine." Surely those who read this article will agree that there is one animal, at least, which ought to be exterminated.

Let those who are waging war on the cat as a possible disease breeder turn their attention to the rat, which is ten thousand times more dangerous to our health as well as a direct enemy of our wealth. Says Mr. Cooper:

"Of natural enemies of the rat, the best-known terriers and the common alley cat — too often a disturber of slumbers — deserve the highest commendation. The better this use of the often despised cat is understood, the sooner will efforts be made to conserve him, instead of efforts being made through legal measures for his destruction. The 'flying cat,' as some Frenchman has named the owl, is one of the chief destroyers of the rat in the rural districts, but too often the farmer has put forth the utmost effort in trying to exterminate this useful creature. From a money point alone, he is far more of an asset than a liability."

The Squirrels. How many of our squirrels do you personally know? One, surely — the big, sleek gray squirrel, found all over the country in one variety or another, and found where you can watch him, from the city parks to the wild woodlands.

Whenever I see a big crowd of busy men and women on Boston Common I know that somebody is haranguing them, or that one of the gray squirrels is entertaining them as he hides nuts in the grass. They scamper over my barn here in the country, rifle my sweet corn on the stalks, and carry off every shagbark before I can get at them.

"Their habits vary but little whether they live in deep forests or within the limits of a town," says the author of "American Animals." "Finding a suitable hole in a tree, they enlarge it to suit them, preferring to have plenty of room inside to move about in. The other day I watched one gathering dead leaves for his bed in an old apple tree. He would run out along the branches to where the brown leaves hung shriveled in clusters of two or three, rustling in the November wind. Biting off the twig that bore them, he would hurry back with it to his hole. Once the leaves were all brushed from the twig as he went in, and, if ever there was evident surprise and annoyance, it was depicted on his little gray face when a few seconds later he peered out of his doorway, looking for the leaves that he missed. Often half a dozen or more will occupy the same hole, and though the old males are apt to be unpleasantly ugly and tyrannical, they generally appear to get along pretty well on the whole. They also make nests of leaves in the forks of trees, beeches in most instances; they cut off the leaves in branches, while they are still green in summer, and place them in successive layers on a rough platform of twigs in such a manner as to shed the rain perfectly, but without leaving room for more than one or two inmates within.

Photographs by A. R. Dugmore

THE GRAY SQUIRREL (*Sciurus carolinensis*)

One of our easily tamed outdoor neighbors. Try him with a few nuts.

"Gray squirrels warn each other of danger with a kind of flat, rasping bark, finally prolonged into a whining snarl, distinctly audible for an eighth of a mile or more in calm weather."

"We have held our breath at the hazardous traveling of the squirrels in the tree tops. What other animals take such risks — leaping at dizzy heights from bending limbs to catch the tips of limbs still smaller, saving themselves again and again by the merest chance! But luck sometimes fails. My brother, a careful watcher in the woods, was hunting on one occasion when he saw a gray squirrel miss its footing in a tree and fall, breaking its neck upon a log beneath.

"I have frequently known them to fall short distances, and once I saw a red squirrel come to grief like the gray squirrel above. He was scurrying through the tops of some lofty pitch pines, a little hurried and flustered at sight of me, and nearing the end of a high branch was in the act of springing, when the dead tip crackled under him and he came tumbling headlong. The height must have been forty feet, so that before he reached the ground he righted himself — his tail out and legs spread — but the fall was too great. He hit the earth with a dull thud, and before I could reach him lay dead upon the needles, with blood oozing from his eyes and nostrils."

The Red Squirrel. But if one red squirrel gets such a fatal fall, the great majority of them live through all the hazards of life as very few other animals do. This is the best-known wild mammal, I suppose, in North America. Every child has had a scolding from this peppery little firebox — and deserved it, no doubt.

The red squirrel has a bad reputation as a birds'-nest robber, and I suppose every naturalist in the country has seen him red-handed at the work but myself. I have watched for years. Only a few days ago a whole crowd of birds were driving a chickaree about the trees here, but I could see nothing wrong in the little sinner's conduct. They are saucy, bold, daring, and thieving of grain, I know, whatever they do or do not do with birds' eggs. They build in my icehouse, in my house cellar, in my tallest trees, a nest of shredded cedar bark as big as a crow's nest — using the old crows' nests at times. Both the red and gray squirrels' winter nests are a wild kind of bed.

There are winters when both squirrels stay in the hollows of trees. A secure and sensible harbor, this, in which to weather the heavy storms, and I wonder that a nest is ever anchored outside in the tree tops. The woodsmen and other wiseacres say that the squirrels never build the tree-top nests except in anticipation of a mild winter. But weather wisdom, when the squirrels are the source, is as little wise as that which comes from the weather bureau. I have found the nests in the tree tops in the coldest, fiercest winters.

"It is not in anticipation of fine weather," I wrote in "Wild Life near Home," "but a wild delight in the free, wild winter, that leads the gray squirrel to swing his hammock from the highest limb of the tallest oak that will hold it. . . . He loves the tumult and the terror. A night never fell upon the woods that awed him; cold never crept into the trees that could chill his blood; and the hoarse, mad winds that swirl and hiss about his pitching bed never shook a nerve in his round, beautiful body. How he must sleep! And what a constitution he has!"

The Chipmunk. Yes, nine out of every ten of you know the little striped ground squirrel, the chipmunk, as well as you know Mary's little lamb — and a great deal better! Blessings on thee, little tike! What would my old stone piles be without you?

COMMON EASTERN CHIPMUNK (*Tamias striatus*)

The chipmunk has cheek pouches, lives in the ground, and belongs to the gopher and spermophile family rather than to the group of which the red squirrel is a member. All over the country this group is found in many varieties and species, our little chipmunk, the Western spermophile, golden mantle squirrel, and Day's spermophile being among those commonly seen.

CHIPMUNK'S HABITS

In "The Lay of the Land" I have this story of Chipmunk:

"One morning (it was June-bug time) I stopped and watched a chipmunk that sat atop the stone wall down in the orchard. He was eating, and the shells of his meal lay in a little pile upon the big flat stone which served as his table.

"They were acorn shells, I thought; yet June seemed rather late in the season for acorns, and looking closer I discovered that the pile was entirely composed of June-bug shells — wings and hollow bodies of the pestiferous beetles!

"Well, well! I had never seen this before, never even heard of it. Chipmunk, a *useful* member of society! actually eating bugs in this bug-ridden world of mine! This was interesting and important. Why, I had really never known chipmunk, after all!

"So I had n't. He had always been too common. Flying squirrels were more worth while, because there were none on the farm.

"Later on in the summer I had a little patch of oats that ripened ready for the barn. I mowed the oats as soon as they began to yellow, cocking them to cure for hay. It was necessary to let them "make" for six or seven days, and all this time the chipmunks raced back and forth between the cocks and the stone wall. They might have hidden their gleanings in a dozen crannies nearer at hand; but evidently they had a particular storehouse, near the home nest, where the family could get at their provisions in bad weather without coming forth.

"Had I removed the stones and dug out the nest, I should have found a tunnel leading into the ground for a few feet and opening into a chamber filled with a bulky grass nest — a bed capable of holding half a dozen chipmunks — and, adjoining this, by a short passageway, the storehouse of the oats. . . .

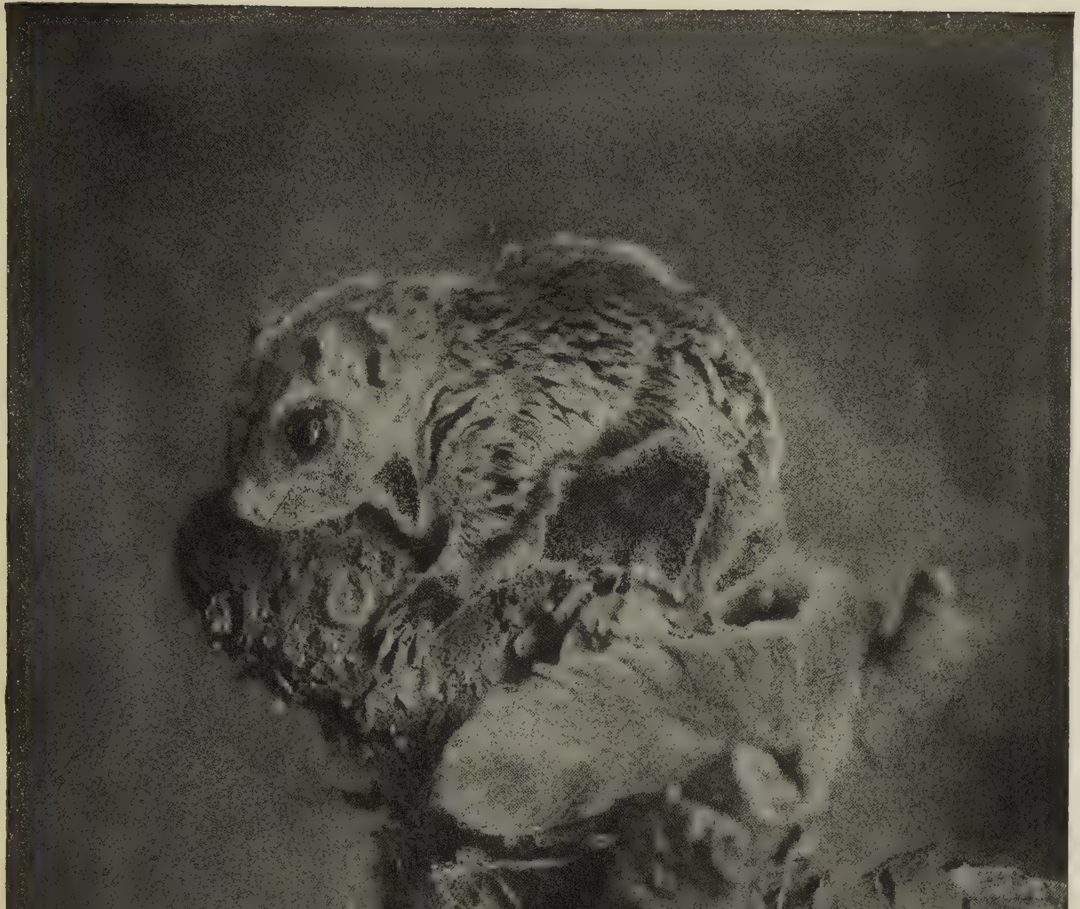
"When the first frosts come, the family — if they are still a family — seek the nest in the ground beneath the stone wall. But they do not go to sleep immediately. Their outer entrances have not yet been closed. There is still plenty of fresh air and of course plenty of food — acorns, chestnuts, hickory nuts, and oats. They doze quietly for a time and eat, pushing the empty shells and hulls into some side passage prepared beforehand to receive the débris.

"But soon the frost is creeping down through the stones and earth overhead, the rains are filling the outer doorways and shutting off the supply of fresh air; and one day, though not sound sleepers, the family cuddles down and forgets to wake entirely until the frost has begun to creep toward the surface, and down through the softened soil is felt the thrill of the waking spring."

The Flying Squirrel. I said a few paragraphs back that there are no flying squirrels on my farm. There may be, for the reason that we so seldom see them is that they are largely nocturnal and exceedingly shy. But how easily they are tamed! I was a great big boy before I got over my love of pets, and when I started out for college I went with fifteen dollars in my trousers pocket and a pet flying squirrel in the pocket of my coat.

"A worn-out, gone-to-holes orchard is a very city of hollows-loving animals, and it was from such an orchard, with a side bordering an extensive copse, that my flying squirrel came. Where the orchard and copse met was an apple tree that has been the ancestral home of unnumbered generations of flying squirrels. The cavity was first hollowed out by flickers. The squirrels were interlopers. When the young come in April the large opening is stuffed with shredded chestnut bark, leaving barely room enough for the parents to squeeze through. The sharpest-eyed hawk awing would never dream of waiting outside that insignificant door for a meal of squirrel.

"But such precautions are not always proof against boys. I robbed that home one spring of its entire batch of babies (no one with any



By W. E. Carlin

THE FLYING SQUIRREL (*Sciuropterus volans*)

A beautiful member of the squirrel family that is fast disappearing.

love of wild things could resist the temptation to kidnap young flying squirrels), and tried to bring them up in domestic ways. But somehow I never succeeded with pets. Something always happened. One of these four squirrels was rocked on, a second was squeezed in a door, a third fell before he could fly, and the fourth was the one I took to college with me.

"He had perfect liberty, for I had no other roommate. I set aside one hour a day to putting corks, pens, photographs, and knives back in their places, for him to tuck away the next day in one of my shoes or under my pillow. More than once I have awakened to find him curled up in my neck or up my sleeve, the dearest little bedfellow alive. But it was three stories from my window to the street; and one day he tried his wings. They were not equal to the great flight. I think it is really better to leave your wild pets in the woods."[1]

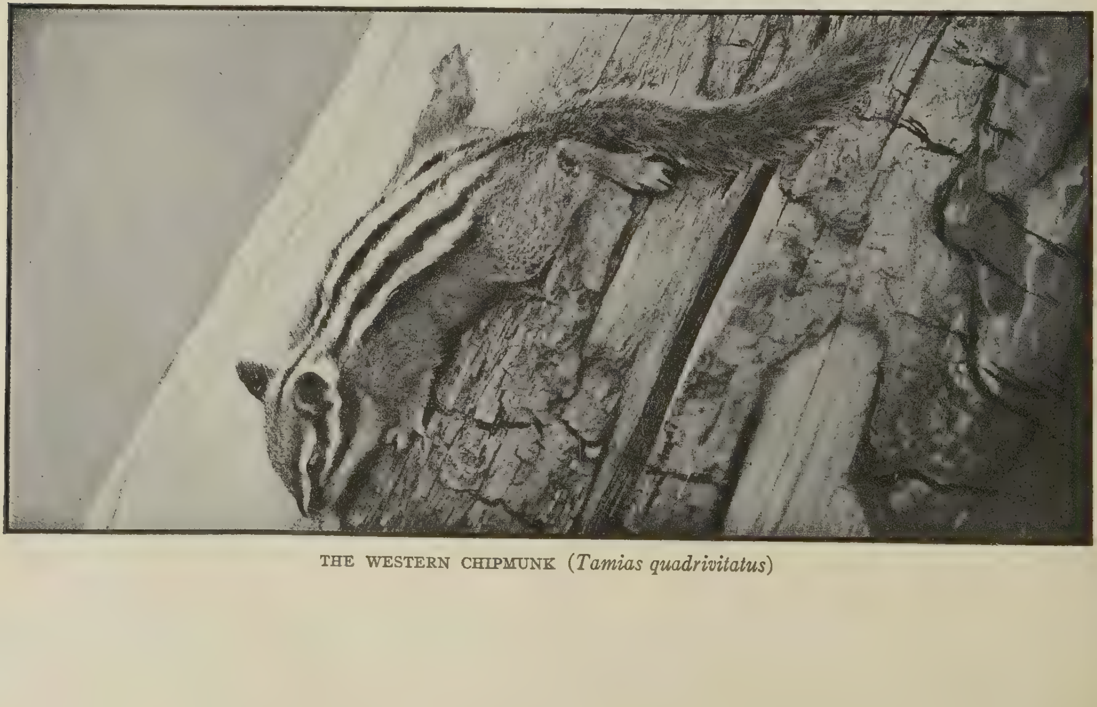
SOME FOREIGNERS TO KNOW

As you watch the ways of your own members of this great family, you will naturally go abroad in your interest to see what other lands have in the way of gnawers. And you will be surprised to find the number of kinds of them in South America — the covies, for instance, which are the ancestors of our guinea pigs, whose soft grunts of joy and squeals of alarm every reader knows. Here too lives the largest of the rodents — the capibara, an animal that weighs nearly one hundred pounds.

Common Chinchilla. "The common chinchilla is a squirrel-like rodent, with large ears, and a tail about half the length of the head and body, the latter measuring ten inches. The fur, which is about an inch in length, is of extreme softness, and of a delicate pearly gray, mottled with black above, and yellowish-white beneath; while the tail is mostly black, with lighter bands on the sides.

"Chinchillas live in burrows, where they associate in large companies, and may frequently be seen abroad during the daytime, keeping, however, to the shade thrown by the rocks. Although by no means shy, the report of a gun is sufficient to send them at once to their holes, and a spot which at one moment may be seen covered with hundreds of these creatures, will be left deserted in an instant. The natives hunt them with the aid of a species of weasel, which enters their burrow. From its peculiar softness and delicacy, the fur has long been highly appreciated in Europe and North America."[2]

Besides these, South America has also the interesting agoutis and pacas.



THE WESTERN CHIPMUNK (*Tamias quadrivitatus*)

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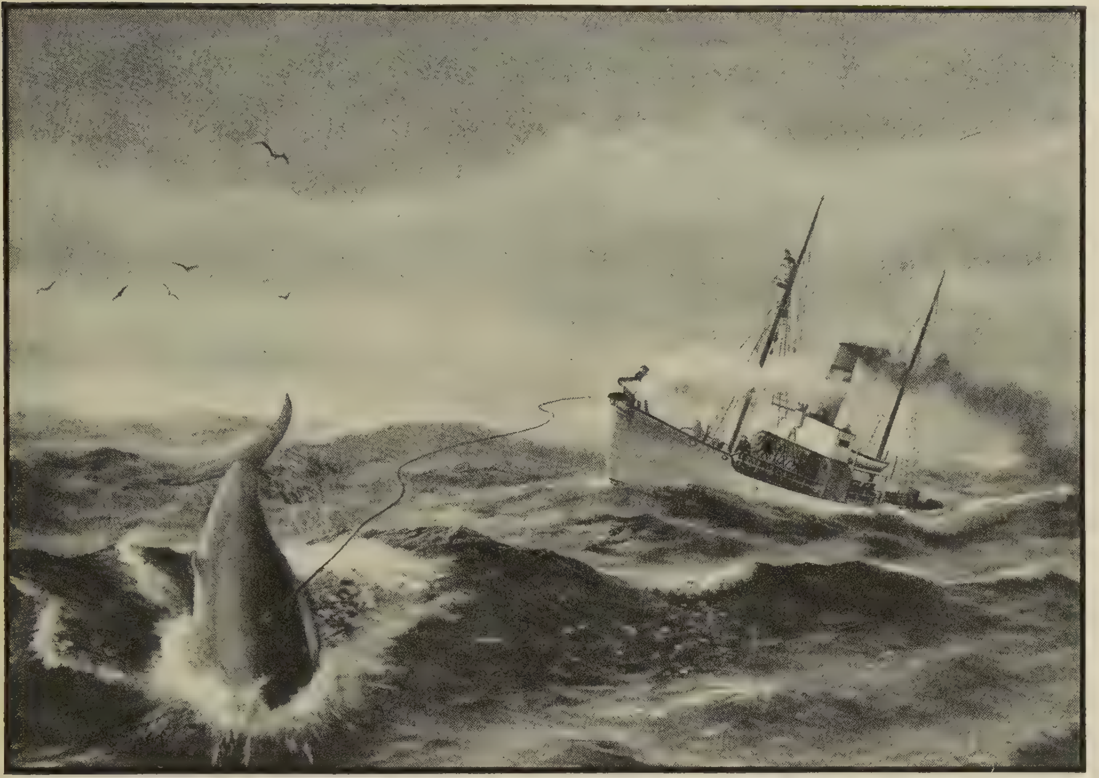
[1] From "Wild Life near Home."

[2] Lydekker's "New Natural History.



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WHALING IN THE PACIFIC

A good shot from the man behind the harpoon gun.

THE CETACEANS

WHALES, PORPOISES, AND DOLPHINS

As these marine mammals have been carefully studied in another volume of this library, I will stop here only long enough to note a few of their interesting characteristics.

Cetaceans include the largest animals now existing on the globe; and they were only approached in point of size by some of the gigantic land reptiles which existed during the older geological periods.

Cetaceans are found in all seas, from the equator to within the arctic circle, and in former years even many of the larger species were extraordinarily abundant in certain regions, although they have been greatly reduced in numbers, and in some instances almost or completely exterminated. Many of the smaller forms, known as porpoises and dolphins, ascend rivers for longer or shorter distances; while some of these, as well as all the members of one family, are exclusively fluviatile, the latter inhabiting the larger rivers of South America and southeastern Asia.

The whole family is carnivorous in feeding habits, the killer whale or grampus living on warm-blooded animals such as seals, while the Greenland whale might "choke on a herring," so small is its throat. Squid and jellyfish and mollusks form the larger part of the great whale's food.

The whales are divided into two groups — the one comprising the true or whalebone whales, in which the place of teeth is taken by baleen or "whalebone," and the toothed whales, characterized by the presence of functional teeth, at least in the lower jaw. These two groups differ from one another in many important respects, and if they are derived from a single stock their common ancestor must have existed at a comparatively remote epoch.

The best known of the baleen or whalebone whales is the Greenland. "The Greenland whale (*Balæna mysticetus*) is a northern species," says Lydekker, "characterized by the enormous size of the head, which often exceeds one third the entire length of the animal, by the high arching of the mouth, and the great number and length of the baleen plates. The latter in the middle region attain a length of ten feet or even twelve feet, and their total number may exceed three hundred and eighty on each side of the jaw. In order to afford room for such enormous structures, the narrow upper jaw is greatly arched from before backward, while the two branches of the lower jaw are widely separated behind, and curve much outward in the middle of their course.

"The manner in which the plates of baleen perform their function has been explained by Captain D. Gray. When the mouth of the animal is closed, the slender extremities of the baleen curve backward in the direction of the throat, the longer ones in the middle of the jaw occupying the hollow formed by the shorter ones behind. When the jaws are opened for feeding, the baleen by its own elasticity springs downward and forward, and thus fills up the whole space between the two jaws, irrespective of their degree of separation. An effectual strainer is thus interposed between the sides of the cavity of the mouth and the external water, which prevents the food swallowed from escaping, while the water taken in at the same time has full means of escape upon the closure of the mouth. The tongue is of very large size, and fills up the cavity between the two series of baleen plates when the mouth is shut, and the stranded prey left upon its surface after the completion of the straining process is swallowed at leisure. The larger lower lip, rising up at the sides above the extremities of the baleen, prevents them from being borne outward by the rush of water as the mouth is closing."

The best known of the toothed whales is the huge sperm whale, which is found in all the warmer seas.

As there is frequently some misconception as to the so-called "spouting" or "blowing" of cetaceans, a few words are advisable on this point. When a whale comes to the surface of the water after a longer or shorter period of submergence, its first act is to discharge the air from the lungs previous to taking a fresh inspiration. The air is expelled from the lungs with great force, and thus rises a considerable height above the surface of the water, and as it is saturated with water vapor at a high temperature, the contact with the cold external air at once condenses this vapor, which forms a column of steam or spray. Frequently, however, a whale commences to "blow" before its nostrils are actually above the surface, and then a certain amount of sea water is forced up with the column of air.

One can never get used to the fact that these creatures suckle their young, and that the female has two teats, placed far back on the abdomen. In order to enable these animals to swim with their mouths wide open, the upper part of the windpipe (larynx) is prolonged so as to reach the opening of the nostrils in the hinder portion of the mouth, and thus form a closed tube from the external nostrils to the lungs.

WHALE HUNTING[1]

"The whale is approached in the most cautious manner to avoid exciting it. If necessary, the oars are used, but in calm weather the paddles are resorted to. When within darting distance, which is about three fathoms, the order is given to the boat steerer to stand up. He instantly springs to his feet and, seizing the harpoon (to which a long rope is attached), he darts it into the whale. If opportunity offers a second iron is also thrown before the animal gets out of reach. When the harpoons are darted the order is given to 'stern all' and the oarsmen make every effort to force the boat astern in order to be well clear of the animal in its painful convulsions from the first wounds received.

"When struck, the whale may attempt to escape by running. If so, every exertion is made by the boat's crew to haul up the animal so as to shoot a bomb into it or work upon it with a hand lance, or, if the creature descends to the depths below, which is called 'sounding,' every effort is made to check the movement by holding on to the line or by slowly slacking

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[1] From work by Captain Hammon.

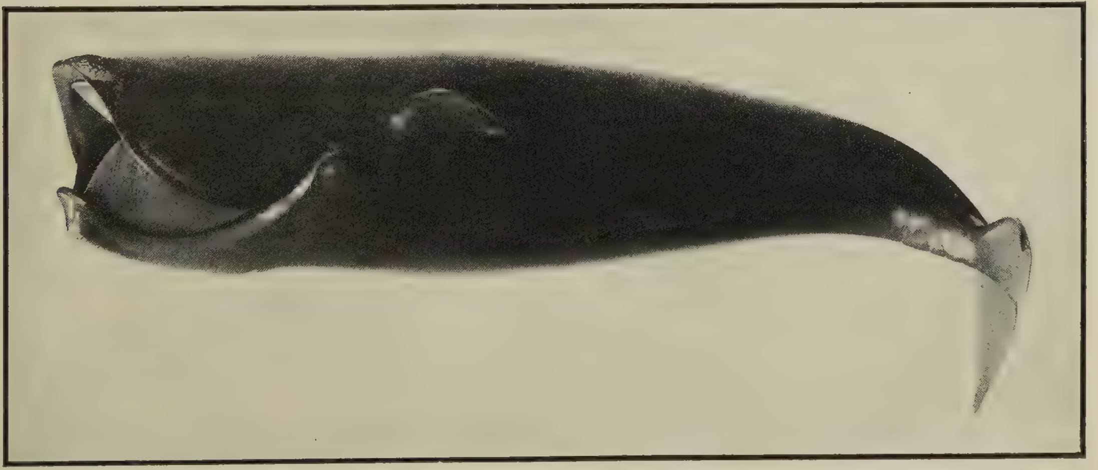
Courtesy of American Museum of Natural History

A HUMPBACK WHALE

it. In this maneuver the boat is occasionally hauled bow under water. Sometimes all the line is taken out almost instantly, when it is cut to prevent the boat from being taken down, and the whale escapes.

"The whale after being struck often runs to windward, thrashing its flukes in every direction. After going a short distance it frequently stops or brings to, at the same time making a terrible noise called 'bellowing.' This sound is compared to that of a mammoth bull and adds much to the excitement of the chase and capture." Another method of bringing the animal to a stop is by lacerating it with numerous harpoons detached from the ropes. "When brought to, it usually remains quite stationary for a few minutes or will roll from side to side, giving the officer of the boat a good opportunity to shoot a bomb lance or use the hand lance with good effect, which soon dispatches it."

With such books at hand as Beddard's, Bullen's, and Hammon's on whales, we need not stay longer here, but may steer on, hoping to "see her blow" before we reach port. For



Courtesy of American Museum of Natural History

A RIGHT WHALE

Note especially the long "whalebone" or baleen hanging down in the mouth. This acts as a strainer which retains the food taken in by the whale, while the water runs out through it.

it is a thrilling sight even from the deck of a great transatlantic steamer to see on the rolling ocean the black hulk of this largest of living animals and the jet of steaming air blown from its giant lungs.

THE DOLPHIN OR PORPOISE[1]

Every traveler at sea and everyone who has seen much of our coast waters knows the bottle-nosed dolphin or porpoise, that comes and goes in schools up and down the coast. Just beyond the breakers their arched backs and pointed fins rise at regular intervals above the surface of the waves and disappear again, as the animal continues on its undulating course. Occasionally, with a stronger leap than usual, the powerful fluked tail is seen above the water. Like other members of the family, porpoises are sociable and always gather in herds or schools of varying size. In this way no doubt they pursue with better effect the mackerel, herring, and other fishes upon which they feed.

Often, at sea, porpoises will associate themselves with some passing ship and for miles at a time plunge along close to her side, perhaps taking the vessel for some gigantic member of their own tribe. They keep close to the prow, as if piloting the ship on its way, and apparently with no thought of the scraps or refuse which they might have secured had they been following in her wake.

Several species of similar habits occur in the North Atlantic, while others are found in the other seas.

THE MANATEE

To me the most mysterious and unbelievable animal in all the world is the Florida manatee or sea cow. It comes nearer to being a mermaid than it does a sea cow. It feeds on grass and vegetable matter at the bottoms of brackish creeks and bays along the Florida coast. "Those kept in captivity," says Mr. Stone, "usually rest on the bottom of their tanks and rise to the surface only for air. They accomplish this with the least perceptible movement of the tail and flapping motion of the paddles, raising the upper part of the body until the head reaches the surface, when the air is admitted through the nostril flap valves, which are closely shut after the operation." They seemed ill at ease when the water was drawn off and were apparently unable to progress on land.

Manatees were once plentiful on both coasts of Florida, but now a few carefully guarded near Miami alone remain. They still wallow in all the inlets and estuaries along the Gulf coast of Central America; and the South American nailless species is one of the commonest game animals of the Amazon and Orinoco basins, incessantly hunted by both Indians and white men for the flesh and the oil.

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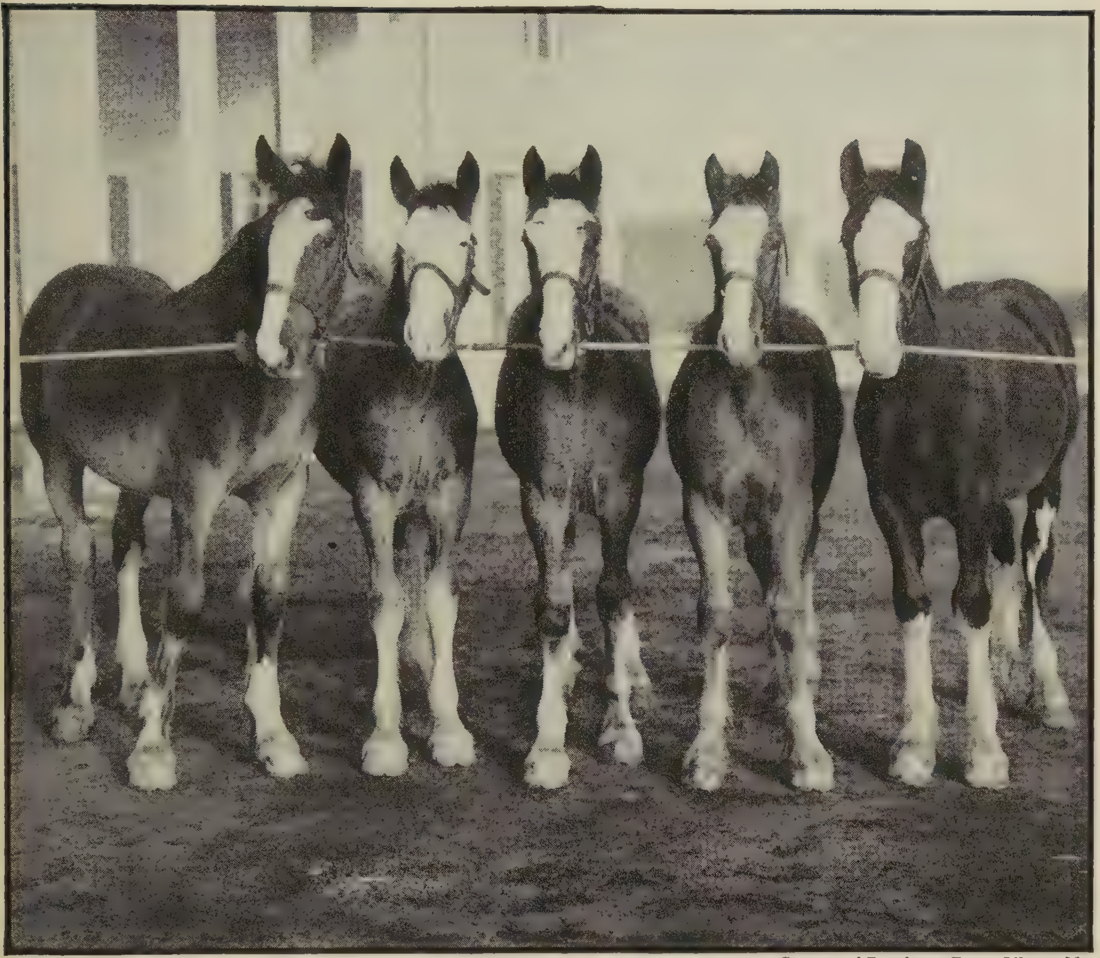
[1] From "American Animals."

Courtesy of American Museum of Natural History

THE COMMON PORPOISE (*Delphinus delphis*)



Courtesy of Broadacres Farm, Liberty, Mo.

CLYDESDALE COLTS

OUR HOOFED ANIMALS

THERE is not a single *wild* hoofed animal that any of us on an ordinary tramp from home may see in its native wild state. The world has grown too small, too crowded, too full of forms and people for these larger animals to be happy in. Yet the deer survive and will no doubt, with the protection that they are more and more receiving, to the end of time. A few years ago, a doe haunted the woods and fields of Weymouth and ate up the garden next to mine here within twenty miles of Boston. But only in the wilder parts of the country will you find the larger members of the family.

Our native hoofed animals or ungulates are comparatively few in number and are grouped in four families, all of them belonging to the "even-toed division."

I. Peccaries of Texas. Small, piglike animals with canine teeth large and prominent and with front teeth (incisors) in both jaws.

II. Deer, elk, etc. With bony branching antlers on the head of the males (and females also in the caribou), which are shed every year.

III. Pronghorn family. Allied to the cattle (*Bovidæ*), but with hollow horns that are forked and shed as in the deer.

IV. Cattle and their allies. With hollow horns fitting over bony prominences on the skull in both males and females. These horns are not branched and not shed annually.

You will see that there is no horse family in this list, no native wild horse in all of North America. That is true, for the mustang or semi-wild Indian pony is not an aboriginal native wild horse. And yet by all the records in the rocks North America was surely the home of the original horse family. It is a long and exciting race that our original horse runs through the rocks — three millions of years ago. That early ancestor of the horse found in the Lower Eocene clay at the foot of the Rocky Mountains had four toes on its front feet and the splint of a fifth and has been called Eohippus. From Lower to Middle to Upper Eocene (a geological period) the toes grew to three, the middle toe growing larger all the time, until, as you see the fingers disappearing in the illustration on page 184, only the middle toe remained.

The Protorohippus. "We may imagine," writes Osborn, "the earliest herds of horses in the Lower Eocene (Eohippus) as resembling a lot of small fox terriers in size, . . . covered with short hair which may have had a brownish color with lighter spots, resembling the sunbeams falling through the leaves of trees, and thus protecting the little animals from observation."

The little Eohippus was succeeded by Mesohippus. Then came Parahippus, followed by Protorohippus, shown in the picture at the top of page 184. By this time the rudiments of the modern hoof were beginning to show.

WHAT BECAME OF OUR EARLY HORSES?

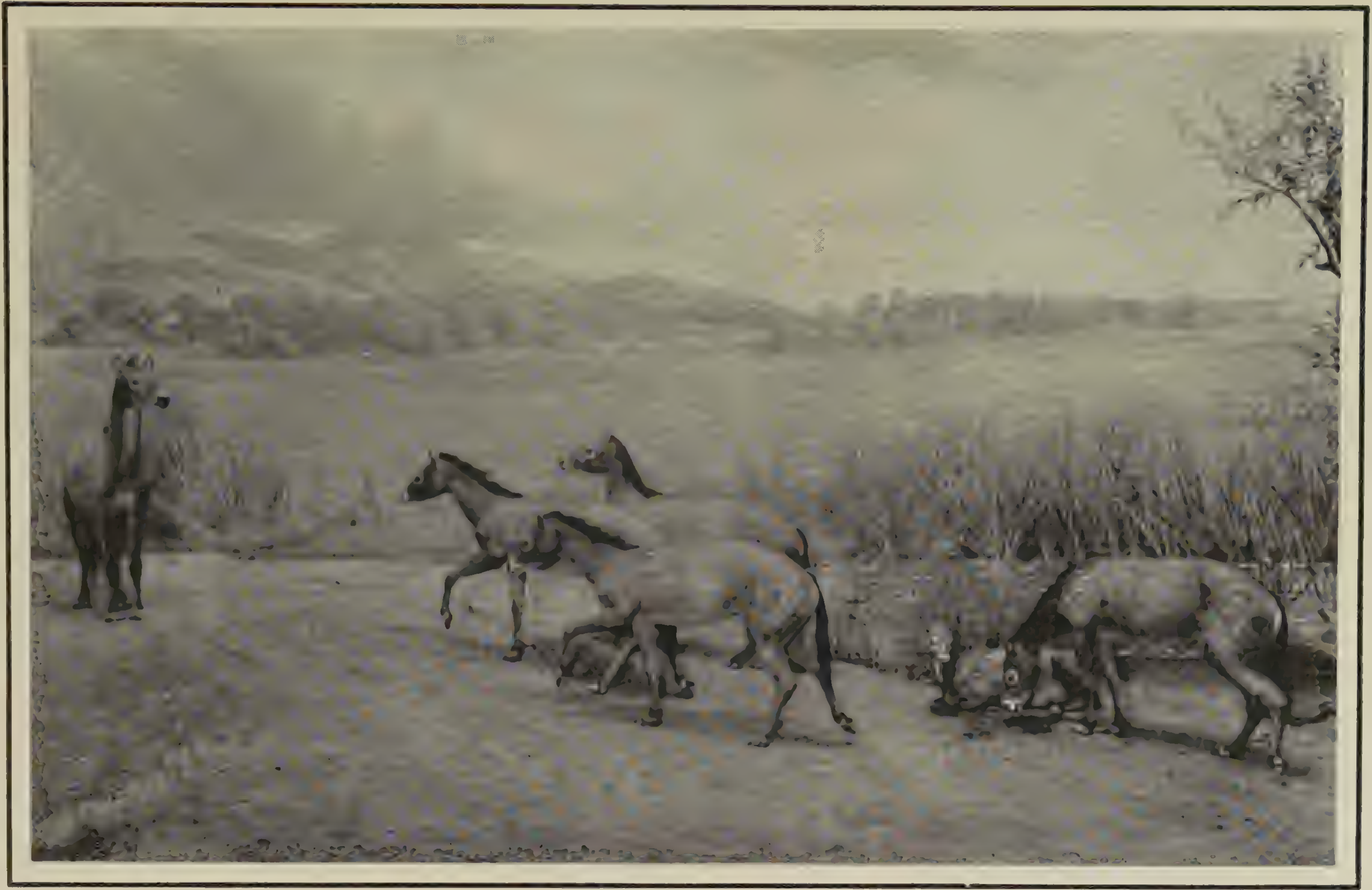
Now why did we not find droves of wild horses on the prairies as we found herds of bison? Their home was here; here their ancestors lived; how is it, then, that wild horses are found in South America and in the Old World, but not here?

"At the commencement of the age of mammals the western part of the North American continent was by no means as high above sea level as now. Great parts of it had but recently emerged, and the Gulf of Mexico still stretched far up the valley of the Mississippi. The climate at that time was probably very moist, warm, and tropical, as is shown by the tropical forest trees, found in fossil form as far as Greenland. Such a climate, with the low elevation of the land, would favor the growth of dense forests all over the country, and to such conditions of life the animals of the beginning of the mammalian period must have been adapted. During the Tertiary the continent was steadily rising above the ocean level, and at the same time other influences were at work to make the climate continually colder and drier. The coming on of a cold, dry climate restricted and thinned the forests and caused the appearance and extension of open, grassy plains. The ancient forest inhabitants were forced either to retreat and disappear with the forests, or to adapt themselves to the new conditions of life. The ancestors of the horse, following the latter course, changed with the changing conditions, and the race became finally as we see it to-day — one of the most highly specialized of animals in its adaptation to its peculiar environment. At the end of the age of mammals the continents stood at a higher elevation than at present, and there was a broad land connection between Asia and North America, as well as those now existing. At this time the horse became cosmopolitan, and inhabited the plains of all the great continents, excepting Australia."

THE GREAT HORSE MIGRATION

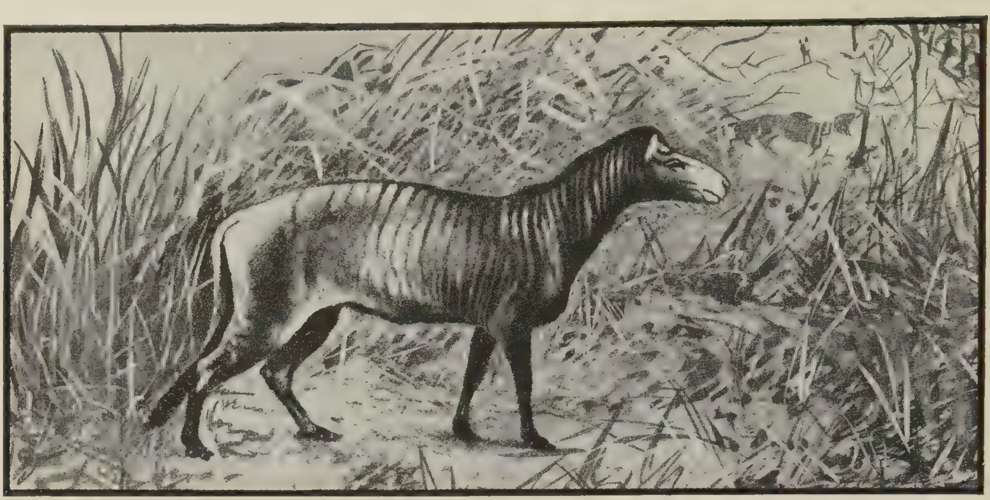
"About the early or mid-Pliocene period," Osborn informs us, "there apparently occurred the long journey of the true American breed of horses into Asia and Europe, and over the newly made land bridge of Panama or of the Antilles into South America. That the true Old World horse actually came from America is inferred because of the sudden appearance in the Upper Pliocene of the Siwalik Hills of northern India, in northern Italy, and in England, of five species of the true horses (*Equus*), of which no ancestors have been found in either Europe or Asia. Another strong argument for their American origin is found in the simultaneous appearance in the same countries of the camel, which we positively know to have been an exclusively American-bred animal."

The Domestic Horse. But how did we get our tame domestic horse, horses, indeed, from the mighty dray horse to the tiny pony? What



Courtesy of Field **Museum** *of Natural History, Chicago*

EOHIPPUS, THE THREE-TOED HORSE, AS HE ROAMED OUR WESTERN PLAINS IN PREHISTORIC TIMES



Restoration by Charles R. Knight

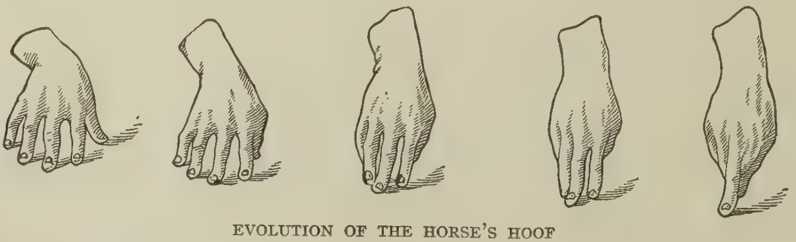
PROTOROHIPPUS OR FOUR-TOED HORSE

Illustration from "American Animals." Used by permission of Henry Fairfield Osborn and The Macmillan Company.

a perfectly fascinating question! And what a story the answer makes! Let us hear it from Professor Osborn's book, "The Evolution of the Horse":

"The conquest of the horse by man marked one of the great turning points in the history of civilization. . . . In the Interglacial or Postglacial period the remains of man and the horse are first found together. The first association occurs in the middle of the Paleolithic or rough-implement period. The discovery of all the possible uses of the horse came very gradually, for there is abundant proof that man first hunted and ate, then drove, and finally rode the animal. The remarkable drawings discovered by Rivière in 1901 in the cave of La Mouthe are believed to be of Paleolithic age. The artists of La Mouthe and other caves in France left outlines partly etched, partly in ocher, of the animals of the chase, the reindeer, mammoth, bison, ibex, and horse, which have, for our purpose, the extreme merit of telling the truth. There are varieties in these drawings which Ewart interprets as indicating a variety of races.

"The prevailing drawings of the Paleolithic horse represent him as hog-maned, with no forelock to conceal the low-bred Roman nose. . . . Besides these Roman-nosed types, to which Ewart traces the modern cart horse, there are others with small heads and flat noses, which Ewart associates with the Celtic pony, and possibly with the origin of the thoroughbred. Other cave drawings, reproduced by M. Capitan, leave little doubt that the ass was known in Europe. It is also certain from abundant evidence in the caves of France that there was a larger horse toward the south, perhaps, while the smaller breeds may have simply frequented the cold northern regions. The horse was at first simply hunted for food, and in the Solutrian period became the chief article of



EVOLUTION OF THE HORSE'S HOOF

Diagram (after Osborn) illustrating by means of the human hand the process of gradual loss of side toes by concentration of weight and service upon the middle digit.

food, as shown by piled-up remains of thousands of skeletons, the long bones of which were split open for the marrow.

"The northern Paleolithic horse was only ten hands high, probably as a result of the dwarfing effects of the severe climate. It was too small an animal to be ridden. It was certainly not very different in appearance from the only true wild horse which now survives in the world, Przewalsky's horse, of the desert of Dzungaria, which was discovered by Poliakoff in 1881, and demonstrated beyond doubt to be distinct from the wild ass of northern Asia and the Mongolian pony. As in the Paleolithic drawings, this horse is unstriped. It is covered with thick hair of a dull-brown or dun color, and has a woolly under covering for winter protection. One of the Przewalsky colts, now in the New York Zoölogical Park, probably gives us a living picture of the horse as he was known to Paleolithic man 30,000 years ago."[1]

THE OTHER MEMBERS OF THE ODD-TOED UNGULATES

Of the truly wild members of the horse family now living there are only three, the Nubian and Asiatic wild asses, and the zebras of Africa; and strangely enough the very wildest of wild things seems to be the zebra, a creature that man has not yet been able to harness either by love or force.

The Tapirs. The nearest living relatives of the fleet and graceful horses and zebras are the small, ungainly tapirs, hiding in the jungles of the tropics. How the lump-nosed wallower in the steaming bogs and fens of the torrid equator takes us back to prehistoric times! He looks like an antediluvian, the little friend of behemoth and the trunk-nosed mastodon. And it is worth while to note that he too originally was a North American.

The four species living in South and Central

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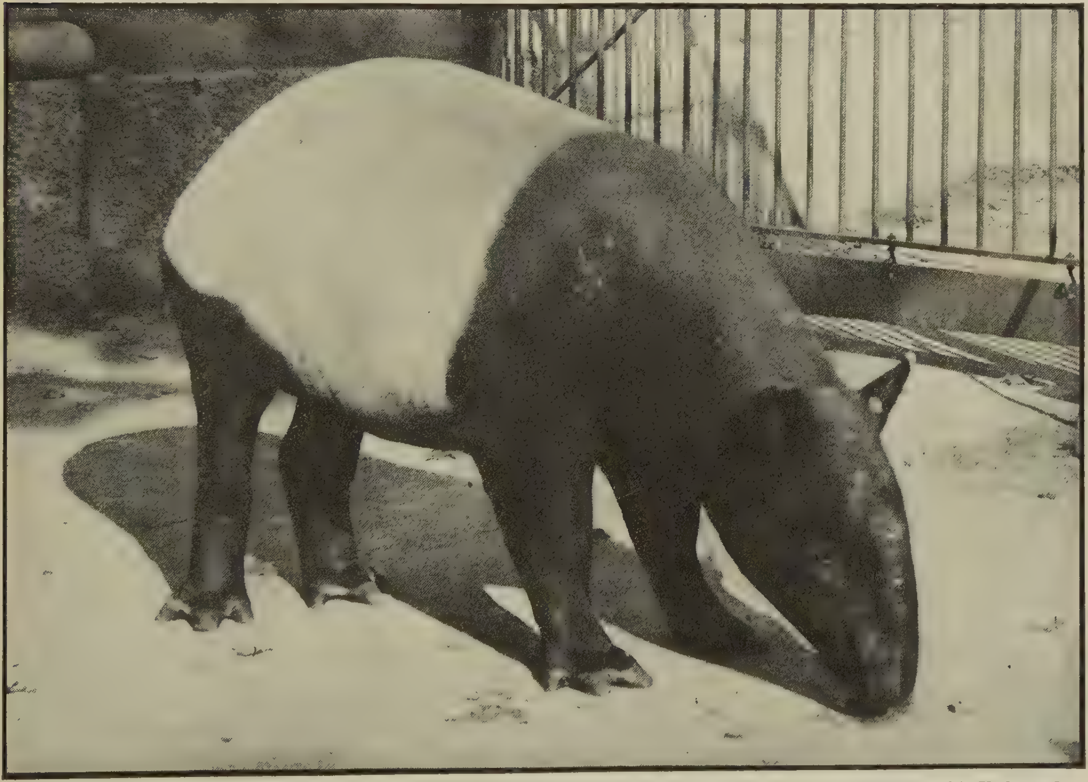
[1] Quoted from Ingersoll's "Life of Animals." By permission of The Macmillan Company.



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THE TAPIR, A TROPICAL RELATIVE OF THE HORSE

America are woods animals, loving, however, the low, swampy places where, like pigs, they can wallow. They are shy and timid, and their young, like so many animals of the light-and-shadow-dappled woods, are born spotted, the better to blend with their spotted surroundings.

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BABY RHINOCEROS ON GERMAN SHOWMAN'S ANIMAL FARM NEAR VICTORIA, AFRICA

Tschudi says: "A broad furrow marks the track along which they have passed, and the plants they encounter in their progress are trampled down or devoured. Such a visit (from a troop) is particularly fatal to the cocoa fields; for the tapirs are extremely fond of the leaves of the low-growing cocoa plant, and they often in one night destroy a cocoa field which has cost a poor Indian the hard labor of a year."

The Rhinoceros. The rhinoceros is the other member of this odd-toed group, and the only one that does not seem to have a page in the great American Rock book devoted to him, though many fossil remains are found of closely related forms.

These exceed in size the largest modern rhino, reaching a length of thirteen feet and standing seven and a half feet tall at the shoulders.

"When either walking, trotting, or galloping," says Selous, "the white rhinoceros always carried its nose close to the ground. A calf always preceded its mother, and she appeared to guide it by holding the point of the horn on the little creature's rump; and in all changes of pace, no matter how sudden, this position was always maintained. This rhinoceros was easily killed by a shot through the heart or through both lungs, but would travel very long distances, and, probably as a rule, ultimately recover from wounds in other parts of the body. . . . In disposition they were sluggish and inoffensive animals, lying asleep in the shade of trees or bushes during the heat of the day, and coming to the water to drink at night, or often before sundown in parts of the country where they had not been much molested."

The American Deer and Others. However, this going afield into far-away Africa for rhinos and zebras is not the business of this book. The preacher is not sticking to his text, for he set out, as you will doubtless remind him, to wander nearer his own home fields and through his own American woods. And surely there is plenty to see there, especially if he goes out after deer or elk or moose or caribou. It means a special journey nowadays, though, far into the wild lands, and the probabilities are that the majority of you will never see any one of our deer alive in its own wilderness.

The Elk or (better) Wapiti. Here is a prince among deer, a splendid noble creature, that still survives west of the Mississippi River, and will, it seems, for ages to come, since the government and various state protective associations have come to its rescue.

The most distinctive characteristic of the deer family is their solid horns or antlers, which are *shed* once a year. The new horn grows rapidly and is for a time soft, full of blood vessels, and provided with a downy covering known as the "velvet." Not until the full growth is attained does the horn became hard and the velvet wear off. The first antlers are very simple, but each succeeding pair is, as a rule, more and more branched, so that a large number of "points" indicates to the hunter an old individual.

Elk are gregarious and polygamous, associating in moderate-sized herds, the strongest bull acting as master of the cows and driving the other aspirants off by themselves until such time as they can prove their superiority and acquire a herd of their own.

At the mating season savage encounters take place between the bulls. Occasionally two individuals have been found dead with their great branching antlers locked together, or perhaps merely the antlers themselves are discovered — a tragedy of former years, ended by starvation or by wolves.

George Bird Grinnell has recently given us an excellent pen picture of a herd of elk, which we cannot do better than quote. He writes: "From a distant ravine comes the shrill, sweet whistle of a great bull elk as he utters his bold challenge to all rivals far and near. You can see him plainly as he walks out from the timber and slowly climbs the hill, followed by the group of watchful cows; and he is a splendid picture. Short-bodied, strong-limbed, round and sleek-coated, he is a marvel of strength if not of grace. His yellow body is in sharp contrast with the dark-brown head and mane, and the hugely branching antlers, wide spread and reaching far back over his shoulders, seem almost too much for him to carry; so that as he marches along with ponderous tread each step seems to shake the earth. At intervals he throws back his head and utters his wild call, and before its first notes reach the ear you can see the white steam of his breath as it pours forth into the frosty air. His cows feed near to him as he steps along, or if one straggles too far he moves slowly toward her and, shaking his mighty horns, warns her to return. If you fire a shot at one of that band, speedily the old bull will show himself the herder and protector of his family. Rushing about from point to point, he will gather up cows and calves into a close

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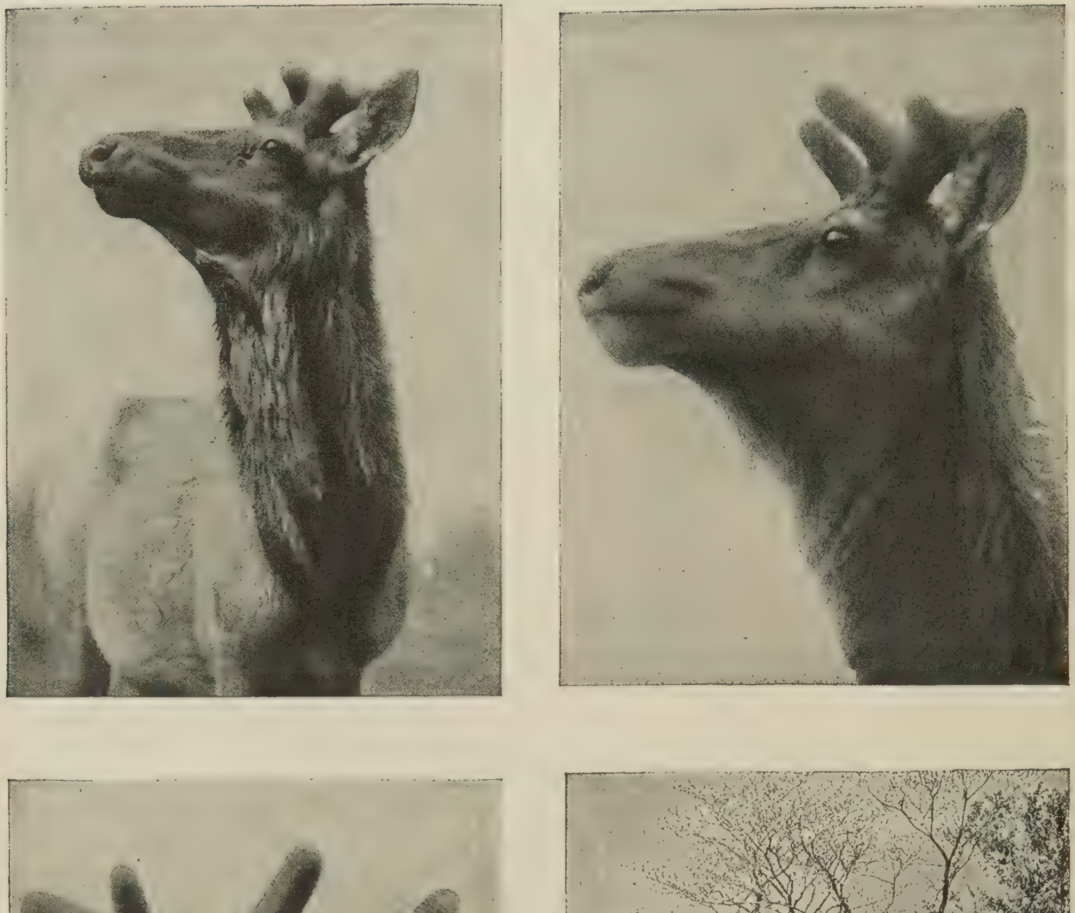
A SOUTH AFRICAN RHINOCEROS



PHOTOGRAPHS TO SHOW THE RAPID GROWTH OF AN ELK'S ANTLERS

Fig. 1, photographed April 2. Fig. 2, April 10. Fig. 3, April 20. Fig. 4, May 7.

bunch and will drive them off over the hills, threatening the laggards with his horns and using them, too, with cruel effect if the cows do not hurry. No chivalry this on the part of the old bull. . . . He drives them forward not because he wishes to protect them from death, but because the cows are his and he does not intend to be robbed of his wives and children."[1]

The Virginia Deer. This is the deer that most of us are familiar with, the only one that still roams wild through the forests and wild woodlands of the Eastern states.

As a wonderful illustration of what wise protective laws and education will do toward restoring and preserving wild life, let me quote from Thoreau, who wrote in 1853: "Minot says his mother told him she had seen a deer come down the hill behind her house and cross the road and meadow in front. Thinks it may have been eighty years ago." Evidently Thoreau supposed that that wild deer seen in Concord about 1770 was one of the last of its race ever to visit that part of the country.

I have already spoken of one that in 1910 was running about as near to Boston as Concord is and much farther removed from the White Mountains than Concord, out of whose forests he doubtless came. In driving over the road in my automobile that same summer, we saw a wild doe in Connecticut that stood by the roadside in the early dewy morning and watched us roll softly past; and about my old home in New Jersey they are hunted still under the good care of the state laws and the wide-reaching pine barrens. Thoreau thought they had been exterminated in 1770 — nearly one hundred and fifty years ago! No, they still live, and will with your help, for outside of man they have few of their natural enemies now to torment them.

There are several varieties of the Virginia deer between Maine, Florida, and California, but hardly difference enough to make a verbal description clear. The white-tailed deer of the Pacific slope, the Texas fan-tailed, and the banner-tailed deer of Kansas are all Virginia deer.

The Mule Deer. While climbing the wild ridge to the peaks of the Steins Mountains one summer, I turned to look back down along the trail to see if I could find my sweater and other garments left at intervals to guide me back in my descent, when lo, standing curiously in front of the sweater half a mile below me, was an old doe mule deer with her fawn at her heels! It was a pretty picture. Both were looking as you would look at a signpost along the road. And it was a signpost along *their* road — a new direction on their trail; and they were not long reading it, for with a quick bound to the side the doe led off swiftly down a ravine.

But away off here in the wildest of the wild regions the deer were very scarce, owing to the destruction over the mountains done by the great sheep flocks that not only eat everything green, but cut the very roots of the grass and even bushes out of the sloping sides with their hoofs, leaving total desolation behind them. As a result of our journey among those mountains the game warden of Oregon writes me that the state has set aside there thousands of acres (435,920 acres or 681½ square miles) as a game refuge where the deer can be protected against the herder and the hunter.

The mule deer, while only a little larger, is distinguished from the Virginia deer by its curious jumping gait, its equally forking antlers, and its black tail, the latter giving rise over a large part of its range to the name "black-tailed deer." Mr. A. G. Wallihan says of this species: "For me, at least, there is a charm about the blacktail or mule deer, that no other game possesses. Barring the bighorn, their meat is the best, their hide tans into the best buckskin, and you turn from the large elk or the agile antelope to the graceful beauty of the blacktail buck and find there the greatest satisfaction. The head of the bighorn is a finer trophy, no doubt, and you are led to grand scenery in the pursuit of him, but it is heartbreaking work. Where you find the blacktail you will find other pleasures, for he delights in the most charming bits of country to be found. He will jump up from the tall weeds and grass among the aspens, so close as to startle you as you ride through them, or will leap into view from the shade of a deep washout far in the desert, where he finds in the feed and surroundings something to suit his taste. He is crafty also, for if he thinks he is hidden I have known him to lie in thick bush until almost kicked out, after all sorts of expedients to drive him out have failed. He has perhaps the keenest scent and the best hearing of all the deer tribe . . . but cannot see as well as the antelope, for I have stood within ten or twenty feet of several passing bands which failed to distinguish me from a stump or rock. Antelope will approach very closely occasionally, out of pure inquisitiveness, but never a deer. If anything moves a deer sees it instantly, but he cannot tell what a still object is."[1]

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[1] From "American Animals."

The Columbian Black-tailed Deer. The *mule* black-tailed is a different deer from the blacktail of the Coast Range Mountains. The mule is a Cascade deer, the real blacktail of the Coast Mountains, loving the deep forests more than the mule deer.

The Moose. It does not seem possible that within two or three hundred miles from where I sit writing, with a vast city in between, there can be stalking through the forests wild moose, the largest of the deer tribe. Yet that is so. This is the true elk and is so called in Europe. So don't confuse our wapiti or elk with the European moose or elk.

The moose stands nine feet high to the tip of his mighty antlers. The Alaskan moose stands even higher. Mr. Witmer Stone[1] thus vividly describes their habits:

"His massive scoop-shaped antlers and monstrous muzzle, in fact, his whole great ungainly carcass, looks as if it might well belong to some of those forgotten creatures whose bones are found in the river drift, or dug up from beneath clay strata, buried in some long-past interglacial epoch.

"Yet the moose lives and breeds in our Maine woods, its flesh serves as an article of food among us and may be bought in the market.

"Furthermore, he seems perfectly well fitted to look out for his own safety. His speed and endurance are astonishing, and he carries his large bulk and spreading antlers easily and swiftly through thickets where a man might well hesitate to force his way.

"His long legs are very convenient when wading about after water lilies, and equally so in reaching upward to peel the bark from the young trees or biting off the tender shoots. When browsing, however, he not unfrequently brings his heavy body also into play, and rearing up rides the tree down by sheer force, thus bringing the upper branches within reach. Feeding off the ground is another matter, however, the neck being too short to compensate for the great length of leg, so that the beast is forced to kneel with the front feet in order to reach the ground in a level spot.

"The moose is eminently an animal of the forest and is particularly at home in the dense thickets surrounding the shallow lakes, bogs, and watercourses of the north woods, where he may be found wading through the water in search of the yellow spatter-docks, the roots of which at certain seasons form one of his choicest articles of diet. Most of the peculiarities of the moose are undoubtedly due to his habits, which are in many respects different from those of other members of the deer tribe.

"In running his movements are described as clumsy, never galloping or jumping, but executing a curious shuffling or ambling gait, tossing his head and shoulders as if about to break into a gallop, but only increasing his speed by lengthening his stride, spreading his hind feet in order to straddle the front ones without stepping on them, his hoofs clacking noisily as he goes.

"He holds his nose up and his antlers laid back on his shoulders to avoid the branches. When he comes to a fallen tree, as high as a man's shoulder, he does not jump it, but simply steps over without changing his gait.

"In winter the moose keep to the hilly woods in the cover of the evergreens and live by browsing on green wood and moss and the resinous foliage of the evergreens. When the snow gets so deep as to hinder their progress, they tramp irregular paths, forming a sort of labyrinth over several acres, making what is known as a 'moose yard,' where they pass the hardest part of the winter, sometimes several families together.

"At the approach of warm weather they move down to the swamps and lake side, where they browse on willow, striped maple, birch, etc.; in order to get at the upper branches of a sapling they will rear up against it and bend it

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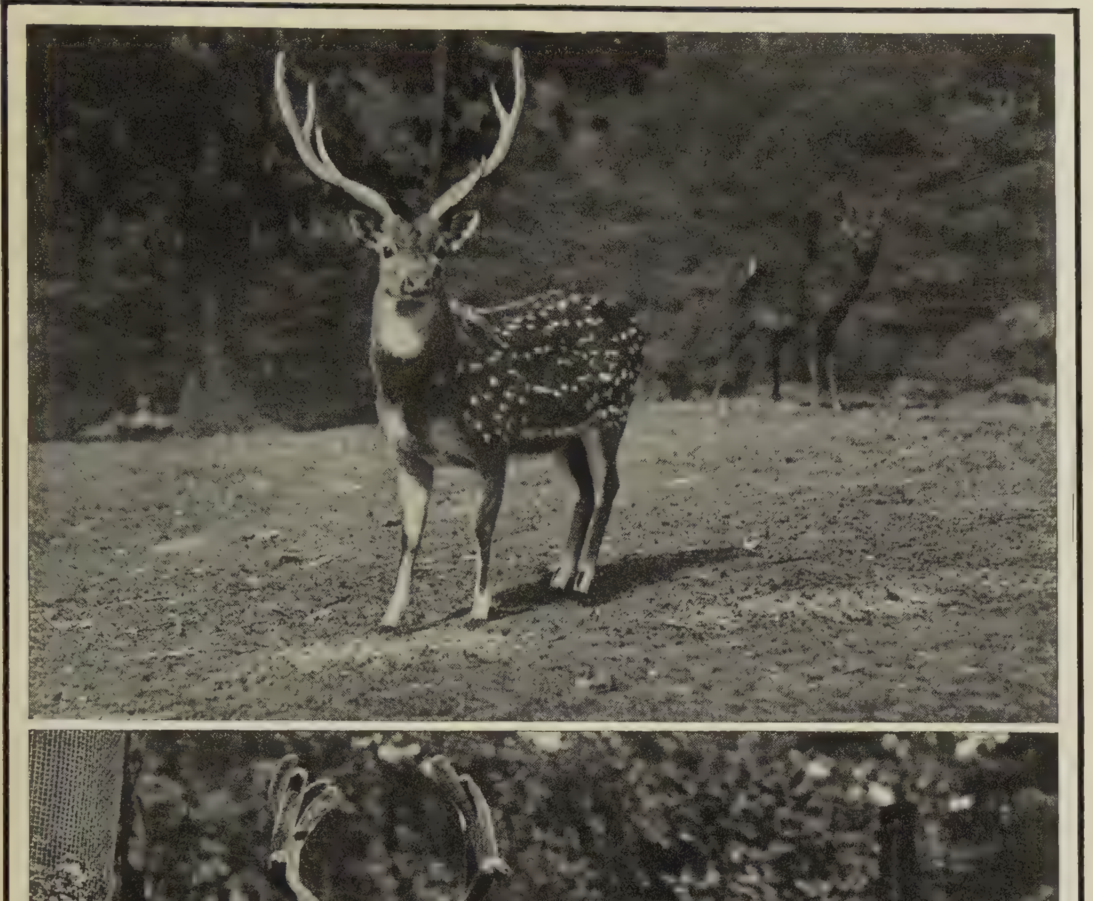
[1] "American Animals."



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TOP: AXIS OR SPOTTED DEER OF INDIA. BOTTOM: MALE MULE DEER IN VELVET down with their weight. In summer they live largely on lily roots and succulent water plants, wading and running out into the lakes and feeding, with their heads partly immersed in the water. During the rutting season, which occurs in the autumn, the old bulls become savage and fearless, roaming the forest on moonlight nights, whistling and calling fiercely and clashing their antlers against trees as a challenge. The cow moose answers with a lower call, which the hunters imitate through birch-bark trumpets, in order to call the bull within gunshot."

The Woodland Caribou. The caribou and reindeer are respectively the American and European varieties of the same animal, though differing enough to be reckoned as distinct species.

The woodland caribou is six feet in length and four feet high at shoulder. It differs from all the preceding members of the deer family in the presence of antlers on the female as well as the male; the muzzle is also entirely covered with hair, and the feet are more deeply cleft. Color, dark dove-brown, grayer in winter, with head and neck nearly white. Antlers with one (rarely both) of the brow tines flattened and palmate, standing out vertically in front of the face; above this another branched tine more or less palmate, and the summit of the antler is again palmately expanded. The exact pattern and extent of the palmation is exceedingly variable.

It ranges the wooded parts of British America, northern Maine, and Montana.

The Barren Ground Caribou. The Barren Ground caribou in all its strange life of fearful struggle is one of the conundrums of Nature. Why do they live at all in such a world of want and waste and unspeakable hardship, when, instead of migrating east to the coast and back, they could come south to where the green of the year lasts longer and life has something more of ease?

William Thompson

A HERD OF REINDEER, NORWAY

The caribou and reindeer are American and European varieties of the same animal. They travel always in herds.

The Barren Ground caribou is the smallest of the group. "Its range," writes Warburton Pike, "appears to be from the islands in the Arctic Sea to the southern part of Hudson Bay, while the Mackenzie River is the limit of their western wandering. In the summer time they keep to the true Barren Grounds, but in the autumn, when their feeding grounds are covered with snow, they seek the hanging moss in the woods. From what I could gather from the Indians, and from my own personal experience, it is late in October, immediately after the rutting season, that the great bands of caribou, commonly known as *La foule*, mass up on the edge of the woods, and start for food and shelter afforded by the stronger growth of pines farther southward. A month afterward the males and females separate, the latter beginning to work their way north again as early as the end of February; they reach the edge of the woods in April, and drop their young far out toward the seacoast in June, by which time the snow is melting rapidly and the ground showing in patches."

In the fall of 1889 he personally encountered one of the migrations. "With the increasing depth of the snow there was a noticeable migration of life from the Barren Grounds. Ptarmigan came literally in thousands, while the tracks of wolves, wolverines, and arctic foxes made a continuous network in the snow. Scattered bands of caribou were almost always in sight from the top of the ridge behind the camp, and increased in numbers till the morning of October 20, when we were awakened before daylight by the cry of '*La foule*,' '*La foule*,' and even in the lodge we could hear the curious clatter made by a band of traveling caribou. *La foule* had really come, and during its passage of six days I was able to realize what an extraordinary number of these animals still roam in the Barren Grounds. From the ridge we had a splendid view of the migration; all the south side of Mackay Lake was alive with moving beasts, while the ice seemed to be blotted all over with black islands, and still, away on the north shore, with the aid of the glasses, we could see them coming like regiments on the march. In every direction we could hear the grunting noise that the caribou always make when traveling the snow was broken into broad roads and I found it useless to try to estimate the number that passed within a few miles of our encampment. . . . This passage of the caribou is the most remarkable thing that I have ever seen in the course of many expeditions among the big game of America. The buffalo were for the most part killed out before my time, but I cannot believe that the herds on the prairie ever surpassed in size *La foule* of the caribou."

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REINDEER

The Lapland Reindeer. This interesting creature has now become a real American, having been brought over, as you doubtless know, by the United States government, and introduced into Alaska, where the natives are rearing and using them as the Laplanders have for centuries.

The Laplanders and the Finns have from time immemorial kept the reindeer as a domesticated animal. The Koreki, a tribe of northern Siberia, have herds of forty or fifty thousand; but the Laplanders have rarely more than five hundred. The Laplanders migrate with their herds, allowing them to mix with the wild reindeer in September, to improve the stock. Not only are the animals useful as food, but the hides, horns, and sinews are all converted into articles of clothing, or implements of various kinds. Their rich, creamlike milk is made during the summer months into cheese — an important food article with these northern people. In Lapland and Norway the reindeer is used extensively as a draught animal, but they are only required to pull light, boatlike sledges over the snow. In some places, however, they are saddled and ridden by the natives, a pad over the shoulders serving as a saddle and a long staff acting as a substitute for the stirrup in mounting. Pack saddles, also carrying from seventy-five to one hundred pounds, are sometimes carried. Often a train of six to twelve reindeer, each with its burden, may be seen among the Tungus of northeastern Siberia.

The Pronghorn Antelope. I traveled hundreds of miles one summer to catch up with a band of these swift creatures of the sagebrush desert, and never caught them. They are rapidly fading away. Where a dozen years ago they were plentiful, to-day you can find only a small, wary band that are sighted only once or twice in a summer. In the rimrock plains of the West its only enemies besides man now are the coyotes, and of these it has little fear except for its kids being so fleet of foot as to leave the swiftest wolf or greyhound behind.

"As spring comes on," says Mr. Stone, "the females separate from the rest of the herd and give birth to their kids, usually two in number. These they keep in hiding and watch jealously for a fortnight. At the end of a short time they are strong and reliant on their legs and capable of following their mothers wherever they go.

"The herd now wanders out over the open plains and low, rolling foothills, where the wide, free outlook makes it possible for them to detect danger at an immense distance. When alarmed, they crowd together and dash away like the wind, and being easily the swiftest runners on the continent, are in little danger of being overtaken. Their innate curiosity, however, often gets them into trouble. A handkerchief on the end of a stick, or anything, in fact, that excites their curious interest, will frequently draw them within gunshot, unless they manage to get the wind of their enemy, when, scenting danger, they are off and away.

"During the summer months the old bucks live apart from the females and their families; toward autumn, however, they become more sociable and friendly, and join their mates once more, the herds constantly increasing in size until November.

"In defending their kids the females use their sharp hoofs with savage effectiveness, striking a quick downward blow with their fore feet that might disable a wolf that came too close. It is said that they will cut a rattlesnake to pieces before he has a chance to strike."[1]

The Mountain Sheep or Bighorn. Upon the top of my bookshelves lies a pair of horns, ridged, curving backward and outward, massive and powerful — horns that were once shaken at the world from the highest altitudes of the distant Rockies. They were once the stately crown of a "bighorn" or Rocky Mountain sheep.

Away in the cloudy peaks of the Joseph Mountains I was on the trail of a flock (the last, it is supposed, in northeastern Oregon). It was the wildest, cloudiest world of peaks I ever saw. Here dwelt the sheep; but ah, you had as well hunt for apples on those bleak and blasted crags as at this late day the wary bighorn!

"Their ideal haunts," writes Hornaday,[1] "are the slopes of high mountains, above timber line, near the edge of the snow fields that are perpetual." These, he states, are often covered with luxuriant grass as well as gray moss. In winter they seek lower altitudes and frequent the glades of the pine woods known as "mountain parks." "It is essential, however, that one side of the mountain sheep's home ranch should fall away abruptly in ragged lines of perpendicular rim rock, with acres of slide rock below, in order that the sheep may have the means of escape from their numerous enemies, particularly hunters.

"I once had an illustration of the mountain

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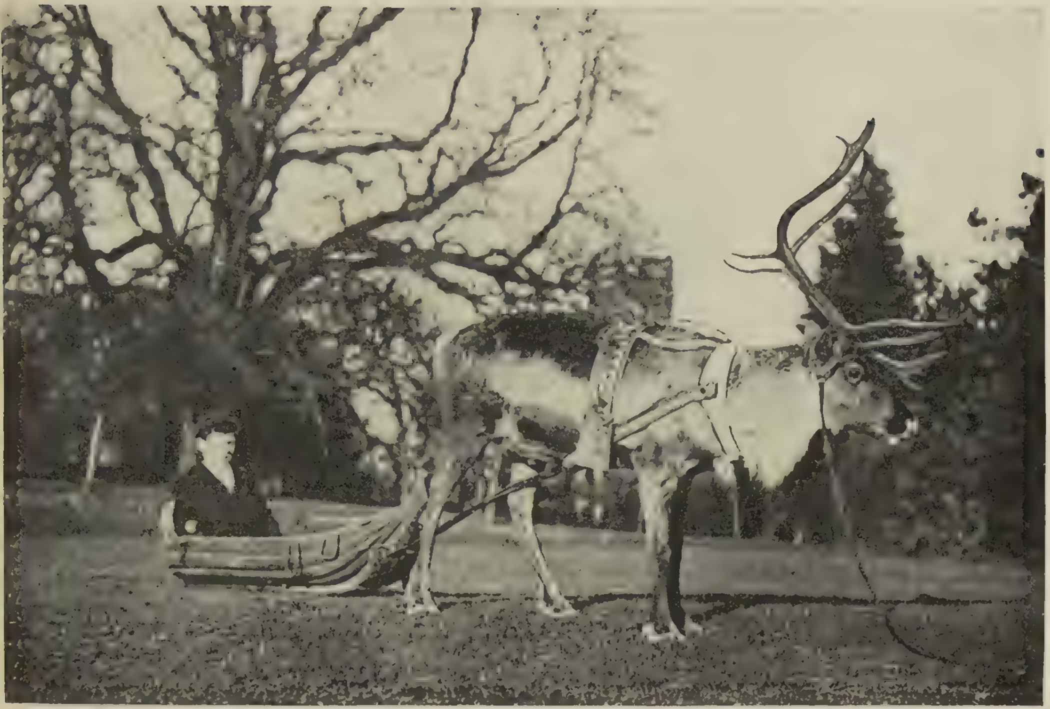
[1] "American Animals."



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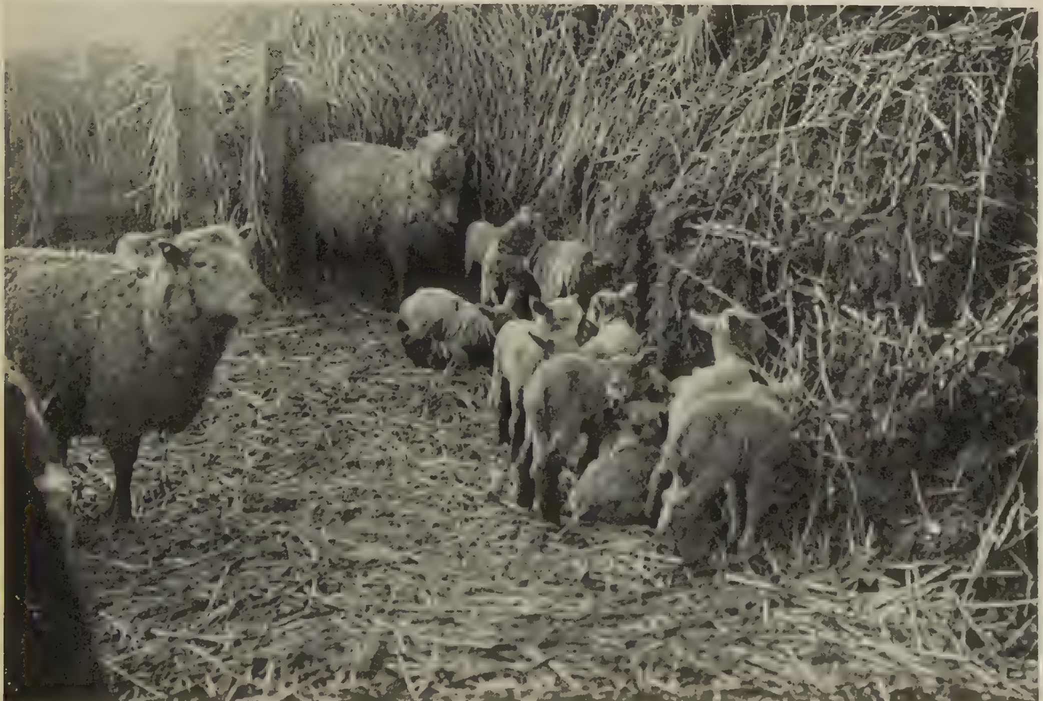
A REINDEER SLEIGH



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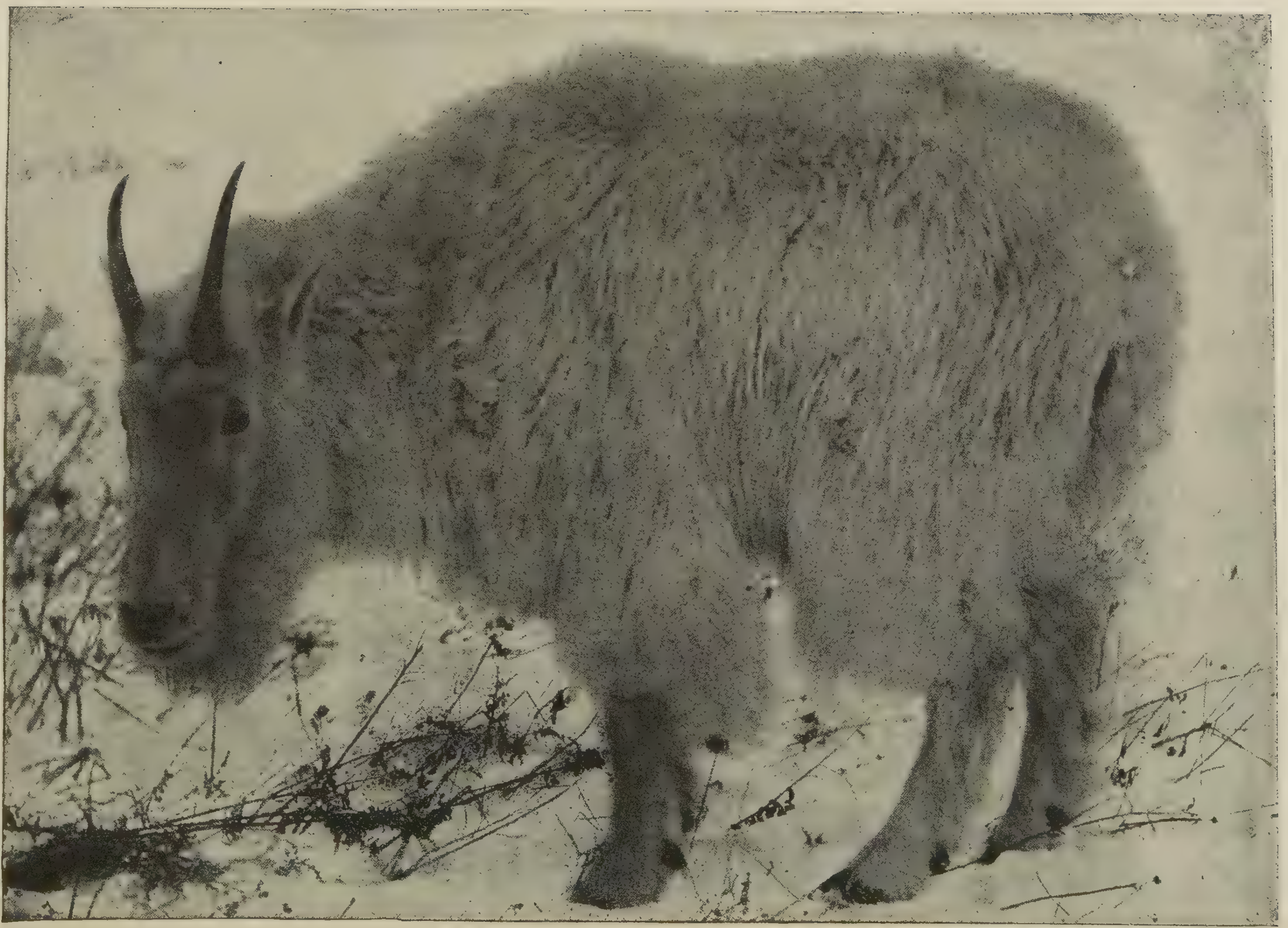
DOMESTIC SHEEP



Copyright, 1902, by Charles I. Rice

MOUNTAIN GOAT (*Oreamnos montanus*)

sheep's tactics on a mountain top where the rock seemed poorly provided for means of escape. Two old rams were feeding at an elevation of about nine thousand feet. The snow was fourteen inches in depth, with a slight crust upon it. When first seen they were in a fifteen-acre open meadow, near the edge of the rim rock, bravely pawing through the snow to reach the longest of the dry, brown stems of bunch grass that thrust their heads halfway up through it. On finding themselves objects of a hunter's special notice the two rams quietly dropped over the sharp edge of the plateau, plowed down a narrow cleft filled with slide rock, and disappeared. Pursuit on their trail led down to the foot of a two-hundred-foot wall of rim rock, and close along its base for a long distance. At last the trail went farther down and dropped over the next lower wall of rim rock in a manner that seemed deliberately calculated to make pursuit more laborious. As a change of tactics the hunt was kept up along the top of the rim rock, but the quarry hugged the wall so closely that not even once was it sighted. It became evident that only by hours of patient work could those animals be encountered again, if at all."

Our White Goat. Very few persons know that we have a native wild goat in the United States, and that the handsomest creature in all its tribe. (See illustration on opposite page.)

Owen Wister gives us this portrait sketch of the magnificent fellow:

"He 's white, all white, and shaggy, and twice as large as any goat you ever saw. His white hair hangs all over him, like a Spitz dog's or an Angora cat's; but it is stiff and coarse, not silky, and against its shaggy white mass the blackness of his hoofs, and horns, and nose looks particularly black. His legs are thick, his neck is thick, everything about him is thick, saving only his thin black horns. They 're generally about six (often more than nine) inches long, they spread very slightly, and they curve slightly backward. At their base they are a little rough, but as they rise they cylindrically smooth and taper to an ugly point. His hoofs are heavy, broad, and blunt. . . . The female is lighter built than the male, and with horns more slender — a trifle. And (to return to the question of diet) we visited the pasture where the herd (of thirty-five) had been, and found no sign of grass growing or grass eaten; there was no grass on that mountain. The only edible substance was a moss, tufted, stiff, and dry to the touch. The largest horns at the base measured six inches in circumference, and twenty-one and one half inches from one tip of the skull and so across, and up to the other tip. I also learned that the goat is safe from predatory animals. With his impenetrable hide and his disemboweling horns, he is left by the wolves and mountain lions respectfully alone."

"Its home is in the far northwest," says Ingersoll, "where the climate is damp and the snowfall abundant. Nowadays it is not to be found south of northwestern Montana. In British Columbia it is widely distributed from the eastern slope of the Rockies to Pacific tidewater; and it is abundant throughout southeastern Alaska. It is a singular fact that sheep and goats rarely live in the same range, or when they do never apparently on the same mountain."

The Musk Ox. Some day (and I was ready to start once) I shall go into the far frozen north to the home of the musk ox. Why? I don't know why. I want to go, as the wild goose wants to go when it hears the arctic gates creaking in the spring and goes winging back to the meadows where the boreal grasses grow. I want to look out upon that white, white world.

"And the Northern Lights come down,
To dance with the houseless snow;
And God, Who clears the grounding berg,
And steers the grinding floe,
He hears the cry of the little kit-fox,
And the lemming, on the snow."

Strange world for any member of the ox tribe! And a strange member is the musk ox, like something left over from Mars or an age long gone. Curious long-haired, shaggy beasts, in appearance halfway between bison and sheep, and combining both in structure and habits the characters of each.

They are strictly arctic, found away on the northernmost shores of Grantland and Greenland and never descending, even in winter, south of the arctic circle! How do they live through that long arctic winter?

For where else are the odds against life so uneven, the chances so slender, the struggle so bitter and long! Can you imagine the arctic winter coming on? This is the manner of its coming by one who has seen it:

"And then of a sudden there is stillness in the air and a gray sky, and with a few white flakes the word of the mysterious north has come. A crisping of the shallow pools and the ducks climb circling into a slender wedge with the wisest and strongest at the point of it. In two hours the shores are desolate of ducks, for they have far to travel and must start betimes. And so the marvelous procession marshals its appointed order with the wisdom that lies behind the flat skulls and beady eyes of winged things. As they come they go. The weaker ones first, who must stay and rest often by the way and brave innumerable dangers in their short journeys, till only are left the swans, whose single flight can be a thousand miles, who seek the high altitudes where the air is thin. Then when the swans have gone, the royal eagles throb down from the arctic in lonely passage along deserted leagues. When the eagles have sped, there is silence on the coasts.

"Little by little the ice forms. Lakes narrow. Headland joins to headland. The male white bears follow out, fishing for seals and walrus. Wood buffalo and musk oxen seek shelter in the land of little sticks, and only the coast caribou and bigger wolves brave the open. The Barren Ground bear hides himself in warmth and sleep, and carcajou finds a deserted fox hole.

"Then comes the snow: light, impalpable, and fine, like star dust, and behind it the first breathing of that north wind that searches the plain for months. The land tightens, shrinks, and hardens. Its rugged ridges are smoothed out in soft curves. Day is obliterated in the half light of a sun that seems a stranger in these regions of death, till, with relentless force and swiftness, rises the steady drone of the wind. Winter has come to the Barren Lands."

Courtesy of Department of the Interior, Ottawa, Canada

THE MUSK OX, A STRANGE ARCTIC ANIMAL

It is halfway between bison and sheep in appearance and habits.

The Buffalo or Bison. This is the solemn and unhappy way that the author of "American Animals" begins his account of the bison:

"The bison can scarcely be reckoned as a creature of our day; already it has taken its place with the aurochs of Europe as a thing of the past. Both species have probably reached the limit of their decline in numbers, and the remaining herds, if properly protected and cared for, may increase considerably in the years to come. But until our present civilization has worn itself out and this part of the earth's surface returns to a state of nature, and the cities have grown up through weeds and bushes to forests and woodland once more, the North American bison must continue only in memory and traditions."

That is true. Yet when I was a young man, in crossing the great prairies of the Canadian Northwest, I saw from the car windows little grass-grown trails running north and south in loosely parallel lines far out over the virgin sod — trails worn there by herds of buffalo that moved in countless numbers over these vast pastures. Already those herds have melted away, and, except in a few public and private parks, gone forever. Yet then their footprints — paths — were still to be seen where the plow had not yet cut the prairie sod.

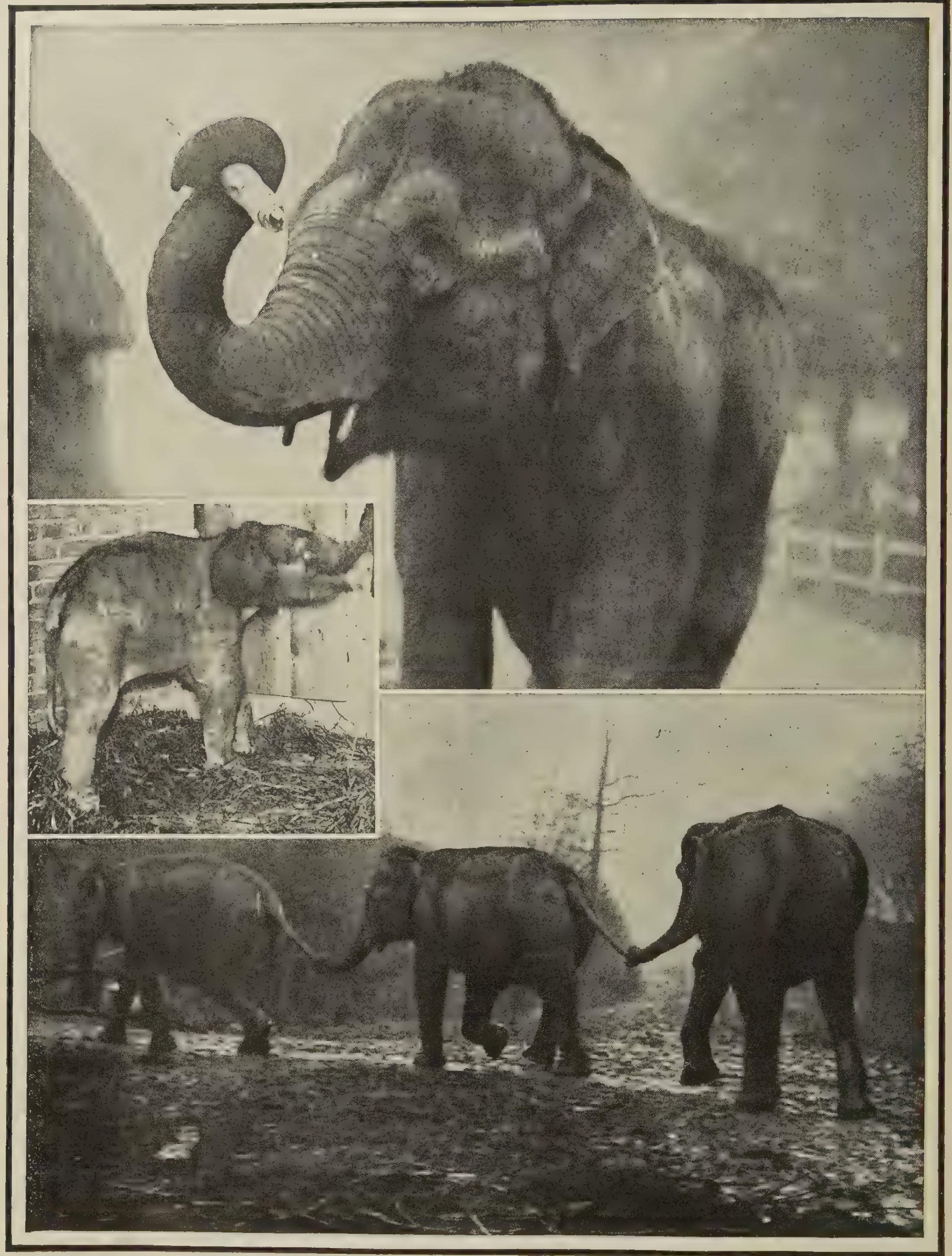
Their numbers at one time were inconceivable. In 1871 Colonel R. I. Dodge wrote:

"The whole country appeared one great mass of buffalo. From the top of Pawnee Rock I could see from six to ten miles in almost every direction. The whole vast space was covered with buffalo, looking like one compact mass."

The Wild Bull. Very closely connected with the bison are the wild bulls and buffaloes of the Old World. In Roman times the great aurochs or wisent or wild ox roamed the wilds of Europe as the bison a few years ago roamed our prairies, and was the source from which our domestic cattle came. The wild white cattle of British parks are albino descendants of these ancient black wisents. Related species in India are the great savage gaur, the most formidable wild beast to hunt in all the earth. Among the true buffaloes we have the great Indian long-horned buffalo, and the African or Cape buffalo with the upward-curving horns.

Field Museum of Natural History, Chicago

AMERICAN BISON



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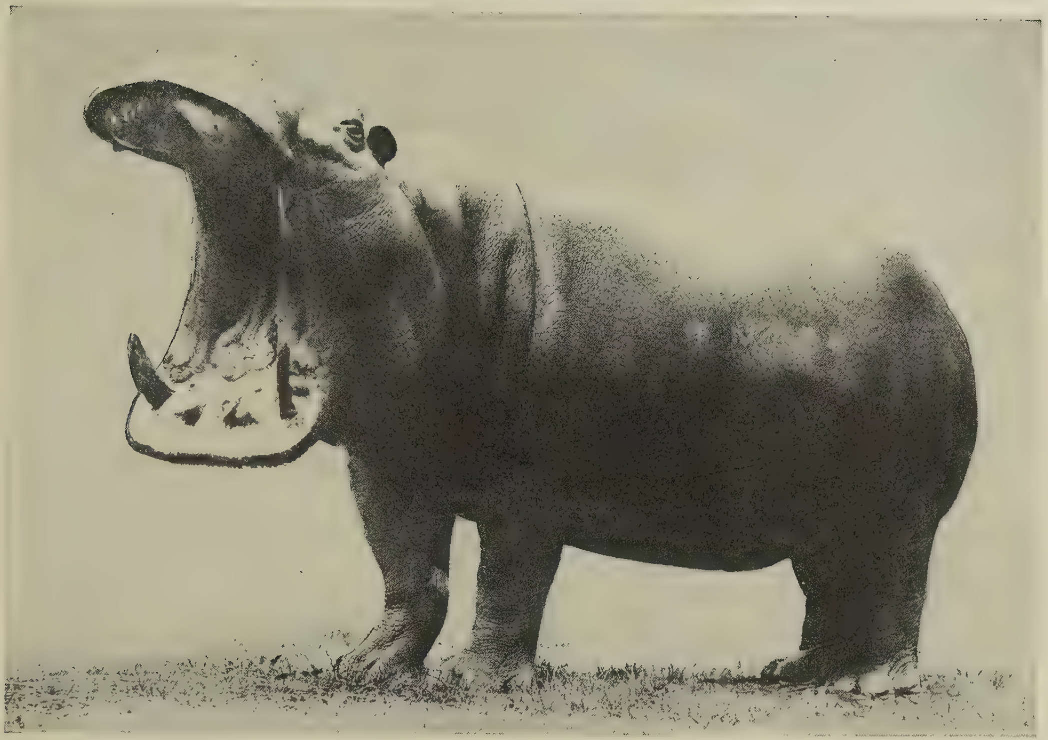
ELEPHANTS

The real Monarch of the Jungle, shown here as tamed, with the elephant at the top carrying a paper; Baby Jumbo in the center; and circus elephants out taking exercise, below.



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HIPPOPOTAMUS

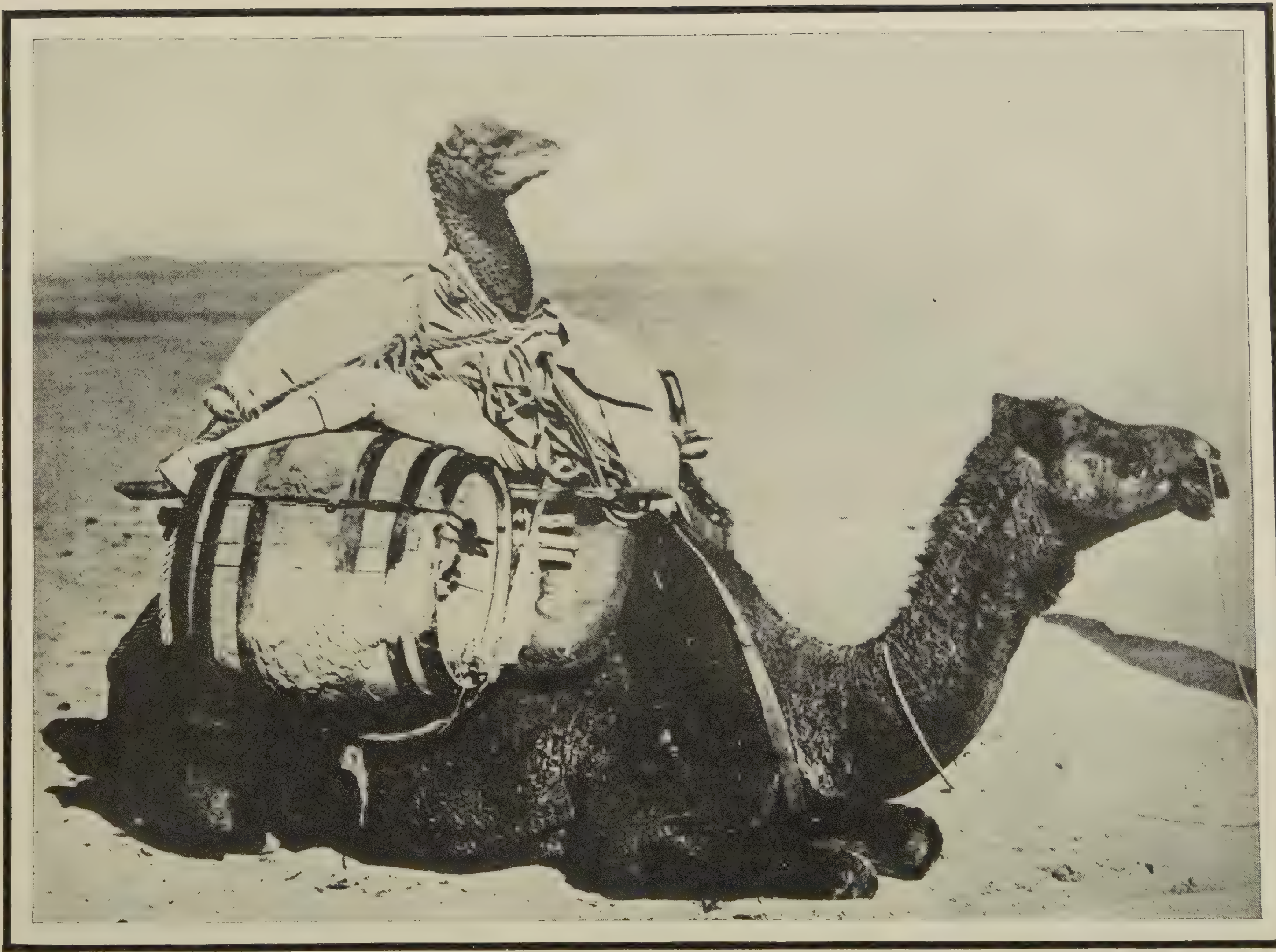
SOME GREAT FOREIGNERS WITH HOOFS

THE aim and scope of this Nature Book forbid more than the mention of the animals of other lands, and indeed the mention of only the most noted of them. Offhand I do not suppose the average reader would for a moment say that the elephants, camels, and hippopotami belong to the hoofed family. But such is the fact, which places this great order of mammals at the very head of the living animal line.

Many of these most interesting foreigners are specialized types, belonging almost to themselves. For instance, the strange-shaped giraffe is neither an antelope nor deer, yet has some of the characteristics of both. It has the distinction of being the *tallest* living animal, carrying its head nineteen feet above the ground. How did it come by such a neck? Evolution says by stretching it after leaves, those with short necks dying off, leaving the longer-necked ones to bestow their necks upon their offspring. But that sort of theory works both ways. It might have resulted in a giraffe with no neck at all from feeding on the low-ground plants. I don't know how to explain these strange forms. Natural selection has had something to do with it, but after years of study and thought it seems just as reasonable and quite as beautiful to find a divine hand at work in the shaping of all things.

The only other member of the giraffe family is the interesting and newly rediscovered okapi of the dense forests of the Uganda border in Africa.

The hippopotamus is another monster foreigner belonging all by himself, and yet closely related to the pigs — a "pig-potamus" really. He may be the oldest of the living hoofed animals, still having four fully developed toes and teeth with the ancient tubercles of past ages. At the present time hippos are found only in



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YOUNG CAMEL ON ITS MOTHER'S BACK

This Australian camel has its young one tied securely to its regular load.

Copyright, International

CAMELS DRINKING A SEVEN DAYS' SUPPLY OF WATER

These camels are to cross the Deserts of India.

the rivers of the Congo basin, in those which feed the lower Zambezi, and in the tributaries of the upper Nile. If some measures are not taken to preserve them, they will sooner or later become extinct.

The camel too must have a word, even though he is familiar to the reader, for he originally was an American, as was also the llama.

"That the camel," says Ingersoll, "got the pads on his feet, the water pockets in his stomach, and other drought and sand resisting arrangements from an ancestry that began in the western United States a million years or so ago, is the novel and interesting outcome of recent discoveries.

"It must be remembered that in the early Tertiary there was a slow but persistent upheaval of the Rocky Mountain region, where a vast plateau, studded with lofty sierras, gradually freed itself from the sea. In those sierras were many active volcanoes, whose outpourings of volcanic dust settled and solidified into rock, forming the whole thickness of many well-known fossiliferous formations. The basins between the mountain ranges contained vast quiet lakes, of which Great Salt Lake is a relic, into which dead animals would drift and their bones become fossilized; and also desert spaces constantly extending, where winds blew the light soil about, and gradually buried dead animals and perhaps buried live ones. In the very oldest of these rocks, at the dawn of the Eocene, have been found what some geologists consider the primitive ancestors of the camel — small creatures, little known; but the Upper Eocene beds yield skeletons of whose affinity to ordinary camels there can be no doubt. These belong to an animal named prototylopus, which was hardly larger than a jack rabbit.

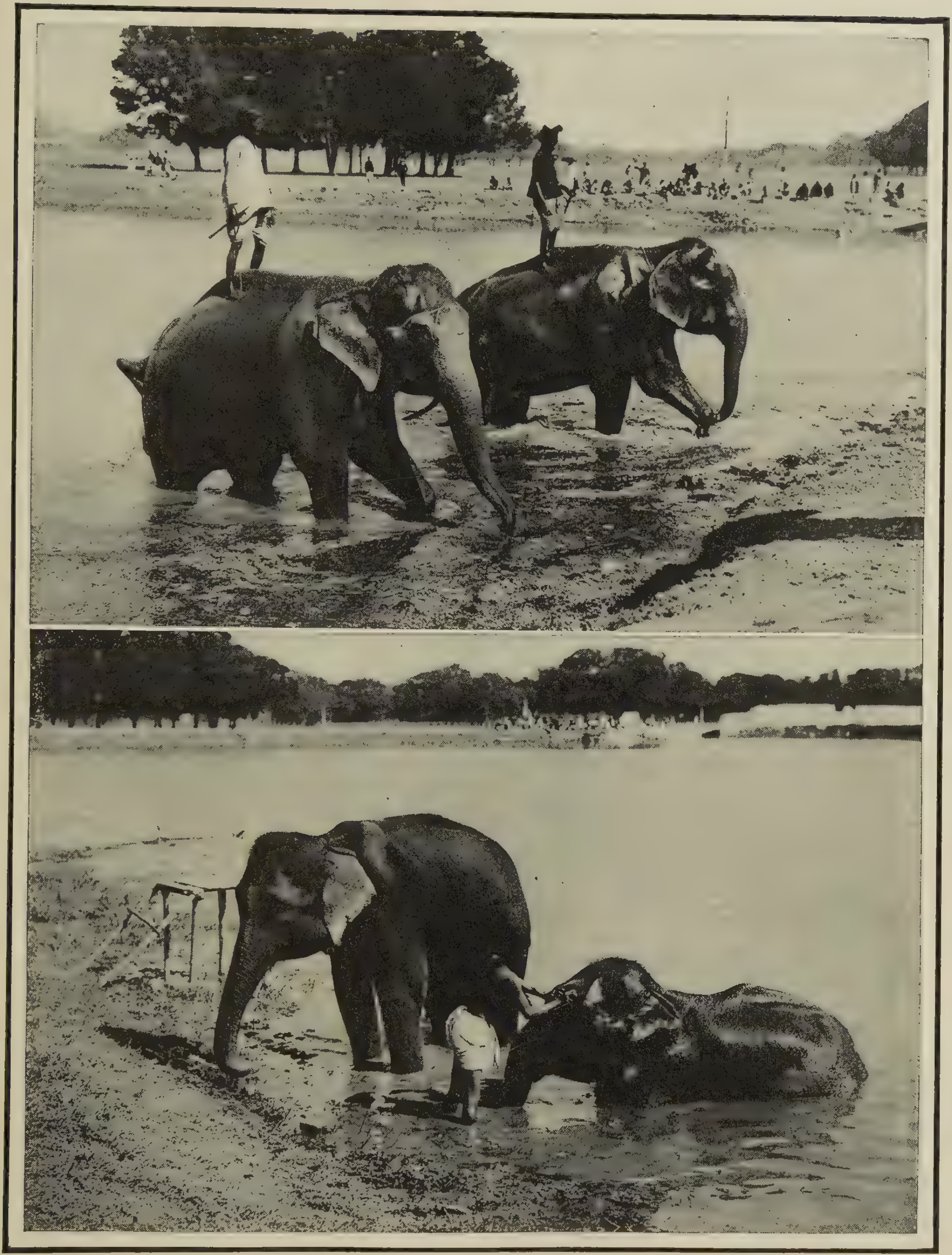
Field Museum

AFRICAN ELEPHANTS

"The camels, then, have always been creatures of the world's desert places, and all their extraordinary peculiarities are adaptations to a desert home."

The Elephant. We will close this chapter with the elephant, which strangely enough is the bulkiest of all land animals and at the same time one of the most intelligent. For size and brains do not always or usually go together. But, stranger still, the elephant's brain is very small and of a low order; the creature itself is a great and almost solitary representative of the departed glory of a commanding race — the primitive, unchanging proboscidea, so called because of their proboscis, or "trunk," which is the upper lip or nose drawn out. In the elephant it reaches nearly to the ground. A few of these animals in India and Burma, saved from destruction only by human guardianship; a few more in Africa, soon to become dependent for survival upon similar protection, alone remain of a former world full of elephants."

In earlier days, about the time of the advent of man, the elephant itself, perhaps, along with the mammoth, roamed north into the farthest borders of Siberia, where in the ice cliffs only recently whole mammoths have been found preserved in the flesh by the cold. That land then was warmer and very differently clothed with vegetation than it is now. You will read of these mammoths in "Animals before Man," Volume One, page 275. You must also read the story of the elephants in Kipling's "Jungle Books."



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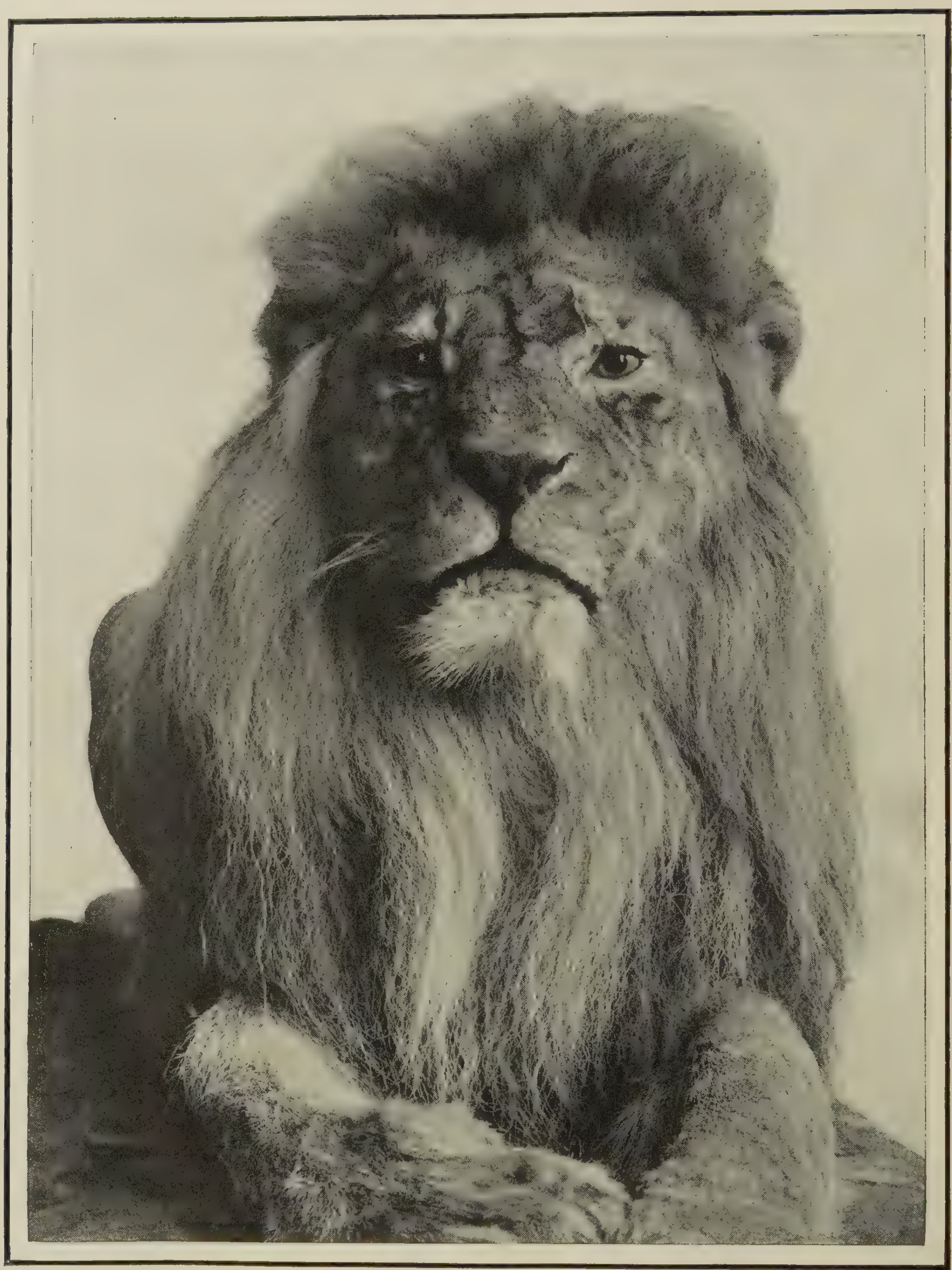
INDIAN ELEPHANTS

Note how much smaller are the ears of these elephants of India, compared to those of the African elephants on the preceding page.



Courtesy of American Museum of Natural History

BARBARY LION, KING OF THE CARNIVOROUS ANIMALS

CARNIVOROUS ANIMALS OF AMERICA

THE BEASTS OF PREY

WE are once more upon home grounds as we take up the study of the beasts of prey. They are an immense family, including in our country such diverse forms as the tawny panther, the great grizzly bear, and the slender weasel. They present many problems, one of which is: "Why do some animals eat up others?" We need to answer that at the start.

It seems cruel, but it is economical. It permits a double use of the always limited food supply. The vegetable eaters gather and digest the raw materials, every sort of growing thing, from microscopic diatoms in the water to solid timber, being utilized by some creature. The vegetable world could support no more animals than are now feeding upon it, and there the population of the world would come to its limit if the eating of a meal of grass put an end to its usefulness as food. But it does not. It simply changes it into the substance of the eater's flesh, which contains all the nutriment of the original, and quite fit. It is therefore to be eaten again by another animal; and so two may exist where one lived before.

Again, it is economy because the beasts of prey really serve the other half of the animal world by keeping the ever growing population of vegetable eaters down. Without this check all the small rodents, say, would so swarm in a few seasons as to destroy the herbage of the world and bring starvation to all.

But you must puzzle out an answer for yourself. Yet one more thought I must touch: What about the poor creatures that are eaten? Are not their lives one long, terrible fear? I have tried to answer that question in "The Face of the Fields."

There are struggle and pain and death in the woods, and there is fear also, but the fear does not last long; it does not haunt and follow and terrify; it has no being, no shape, no lair. The shadow of the swiftest-scudding cloud is not so fleeting as this fear-shadow of the woods. The lowest of the animals seem capable of feeling fear; yet the very highest of them seem incapable of dreading it. For them fear is not of the imagination, but of the sight, and of the passing moment.

"The present only toucheth thee!"

It does more, it throngs him — our little fellow-mortal of the stubble field. Into the present is lived the whole of his life — he remembers none of it; he anticipates none of it. And the whole of this life is action; and the whole of this action is joy. The moments of fear in an animal's life are few and vanishing. Action and joy are constant, the joint laws of all animal life, of all Nature — of the shining stars that sing together, of the little mice that squeak together, of the bitter northeast storms that roar across the wintry fields.

No, not a life of fear. The level of wild life, of the soul of all Nature, is a great serenity. It is seldom lowered, but it is often raised to higher level, intenser, faster, more exultant.

The serrate pines on my horizon are not the pickets of a great pen. My fields and swamps and ponds are not one wide battlefield, as if the only work of my wild neighbors were bloody war, and the whole of their existence a reign of terror. This is a universe of law and order and marvelous balance; conditions these of life, of normal, peaceful, joyous life. Life and not death is the law, joy and not fear is the spirit, is the frame of all that breathes, of very matter itself.

> "And ever at the loom of Birth
> The Mighty Mother weaves and sings;
> She weaves — fresh robes for mangled earth;
> She sings — fresh hopes for desperate things."

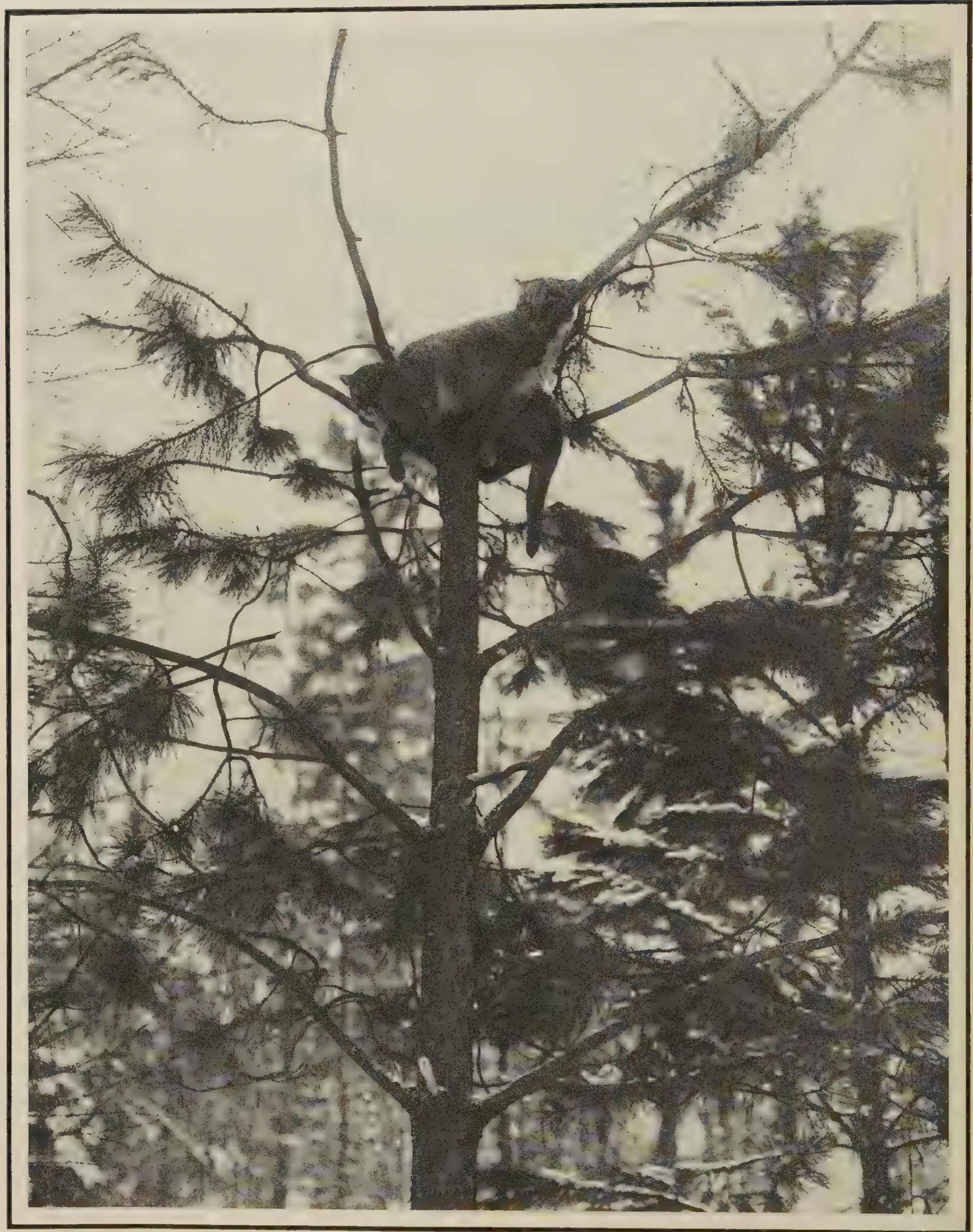
FAMILIES OF FLESH EATERS AND THEIR DISTRIBUTION

I. LAND CARNIVORA

Cats	Cosmopolitan
Saber Tooths	Extinct
Civets	Old World
Hyenas	Old World
Weasels, Badgers, etc.	Cosmopolitan
Dogs	Cosmopolitan
Bears	Cosmopolitan
Raccoons	America

II. SEA CARNIVORA

Sea Bears	Eastern Pacific
Walruses	Subarctic Oceans
Hair Seals	Cosmopolitan



Keystone

MOUNTAIN LIONS RESTING IN TREETOP

Photographed in Glacier National Park.

The Panther. The greatest of North American cats is the panther. But ranging throughout the world, and especially in America in former times, was a huge beast, known as the saber-toothed tiger — the great-ancestor of our great cats.

"Our prehistoric ancestors," says Matthew, "could have told us of an animal much larger and more powerful than any lions or tigers known to us — the great saber-toothed tiger smilodon — which seems to have realized very completely the idea of the King of Beasts as portrayed in medieval tradition. This great carnivore equaled the largest polar or Kadiak bear in size. It was related to the large cats, but was distinguished by its enormous upper canine teeth, enlarged into curving, sharp-pointed tusks; the mastoid neck muscles, serving to draw the head down, were so excessive in size as to make a noticeable fullness beneath the neck, and were evidently far more powerful than are those of any cat, indicating that this animal could strike its head downward with enormous force. Again, while the cat's lower jaw has a wide gape, and can swing back on its hinges to an angle of over ninety degrees, a smilodon could open its mouth at least thirty degrees more, thus giving room for full play by the long tusks. With the head thrown back, the lower jaw lying back almost upon the throat, it was able to strike its daggers deep into its victim, and then, pulling backward, rip a deadly gash in the flesh."

You have read many a hair-raising tale of the puma or cougar, made up for the most part out of the writer's imagination. A few summers ago my friend Finley (the state game warden of Oregon) wrote me that he had been off hunting cougars in the Cascade Mountains, where they do fearful damage to the deer. He said that their ferocity was greatly overestimated, for any mongrel dog could put them on the run up a tree. They are intelligent beasts, and therefore timid, perhaps, for they always act according to the old saw of him who fights and runs away.

"In its essential habits and traits," says Roosevelt, "the big, slinking, nearly unicolored cat seems to be much the same everywhere, whether living in mountain, open plain, or forest, under arctic cold or tropic heat. When the settlements become thick it retires to dense forest, dark swamp, or inaccessible mountain gorge, and moves about only at night. In wilder regions it not infrequently roams during the day, and ventures freely in the open. Deer are its customary prey when they are plentiful, bucks, does, and fawns being killed indifferently. Usually the deer is killed almost instantaneously, but occasionally there is quite a scuffle, in which the cougar may get bruised, though, as far as I know, never seriously. It is also a dreaded enemy of sheep, pigs, calves, and especially colts, and when pressed by hunger a big male cougar will kill a full-grown horse or cow, moose or wapiti. It is the special enemy of mountain sheep. In 1886, while hunting white goats north of Clark's Fork of the Columbia, I found them preying as freely on the goats as on the deer. It rarely catches antelope, but is quick to seize rabbits, other small beasts, and even porcupines."

The American Jaguar. The jaguar is not so long by a foot and more as the puma, measuring about seven and one half feet. Hunters that I have talked with are one in calling it a sly, treacherous beast, rarely attacking man, unprovoked, but as bad as the leopard when wounded.

It is common in Mexico, but is of rare occurrence within the borders of our country, and like other species of southern Texas is only a straggler from farther south. Where plentiful, it preys on all sorts of animals, even overcoming the tapir with ease.

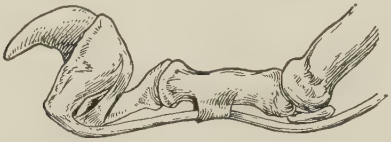
The Ocelot. The ocelot is another big cat — a tiger cat — of the southern half of the New World. Like the larger jaguar, it sometimes wanders into Texas from Mexico, where it is known as "leopard cat."

They are about forty-five inches in length; tail fifteen inches. Their color is rufous tawny or brownish with blackish spots, rosettes, and stripes, very variable in pattern. Below they are white with black spots. The ocelot is a most beautiful, bloodthirsty little creature, yet quite capable of being tamed.

The Lion, Leopard, and Tiger. Here are three of earth's savage kings — queens, rather, so feminine are the cats in their soft ease and grace and beauty, and so quick and terrible in their wrath.

Of these three beasts the lion is least of a king in courage. Those who know the African lion will call him a coward — an arrant coward.

But there is nothing in the veldt or desert that he could not overcome with those mighty paws and jaws of his, did he wish to try. Notice in this sketch of his claw how that weapon (only *one* of the number in each foot) is worked by a powerful tendon.



BONES OF A LION'S TOE

Coward though he may be, once he has tasted human blood he is a very prince of terrors. Col. J. H. Patterson tells a story of how a pair of them "held up" the Uganda railway for three weeks, killing a man or two night after night.

Among my personal friends is Dr. Smith, the "tiger man," who has probably shot more tigers than any other man living. I have read in manuscript some of the chapters in his book called "Tiger Lands." It is his opinion that the great striped tiger, the Bengal or snow tiger of the northern caves of Mongolia, would rather run away any day than fight.

A Rajah of the Jungles. "The habits of the tiger," says Ingersoll, "its nocturnal hunting, its prey, its family life, its behavior when attacked, are practically those of the lion. Both cats are accustomed to their own narrow, almost undisputed way, are moved to exertion mainly by hunger and jealousy, are suspicious of everything strange and inclined to fear whatever they do not understand, are capable of terrific force, yet are dull save in the line of their predatory instincts, and change from timidity to reckless bravado with season, mood, and individual temperament." Judging from the experience of many writers upon the tiger, he goes on to say:

"We must conclude, then, as we did with regard to the lion, that it is unsafe to predict anything precisely as to its behavior; and that tigers differ in characteristics and qualities, quickly adapting their tactics to circumstances."

What makes the leopard a peculiarly dangerous foe is its irritable temper, its agility, its tree-climbing habits, and its ferocity when aroused. It seems fearless when enraged. Much smaller than either the lion or the tiger, it combines the cunning and courage and viciousness of both. It rarely attacks man, but does make a special business of feeding on his pet dogs.

Among all these great cats none is more beautiful than the ounce or snow leopard, which lives in the mountains of Tibet and Mongolia. It keeps always near the snow line, following this upward in summer to the height of eighteen thousand feet or more. There, mostly during the night, it pursues its game, the wild sheep and goats, the musk deer, and marmots; often descending upon the mountain villages in winter and killing some of the smaller domestic animals.

It is a handsome animal, its light gray, woolly fur being marked with black, leopard-like circles and rosettes. The tail is long and heavy; and the legs are massively built, short, and powerful. Altogether, it is well adapted to its wild and rugged home.

Bobcats and Lynxes. There is another family of American cats, of which the wild cat or bobcat and the lynxes are members. When I was about ten years old I lived near a deep river wood known as Garren's Neck Swamp. Here a wild cat had his home. Once I saw the creature glide through the brush near the road where I was cutting down some saplings. And many a night I have lain awake and heard it screaming its perfectly terrible cry out in the swamp. One night I remember it came out into the road screaming, and we children could hear its big, cottony foot pats as it went leaping past the house on the hard road.

It is a wild and savage creature, in length about thirty-eight inches. Legs rather long, ears tufted, tail very short (six inches). General color yellowish-brown, tinged with rufous (much redder in summer), spotted with dark-brown or black, narrow lines on the head and blackish stripe down the back, chin and throat white, below white spotted with black, all of which really gives us no picture at all. If

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LIONESS

you wish to see a wild cat hunting you need only to watch your own pet puss when she is stalking game in the meadow.

Wild cats roam about in the twilight of early morning and evening more than at midday. They sleep in hollow trees and caverns among the rocks and ledges, and in some such place in a warm nest of leaves they hide their kittens. In warm weather they like to doze in the sun, either stretched along a horizontal bough or curled up in a little patch of sunlight in the midst of a berry patch. They wander about all winter in the snow and cold, living as best they may, stalking hares and grouse among the evergreens, or watching patiently beside a squirrel hole in a tree top, just as a domestic cat will stand guard at a mouse hole in the barn.

They resemble the domestic cat in a number of ways, being great mousers and destroyers of small birds and their nests, and equally fond of catnip, rolling over and over in the strong-scented herbs and rubbing it into their fur and eating the blossoms and leaves.

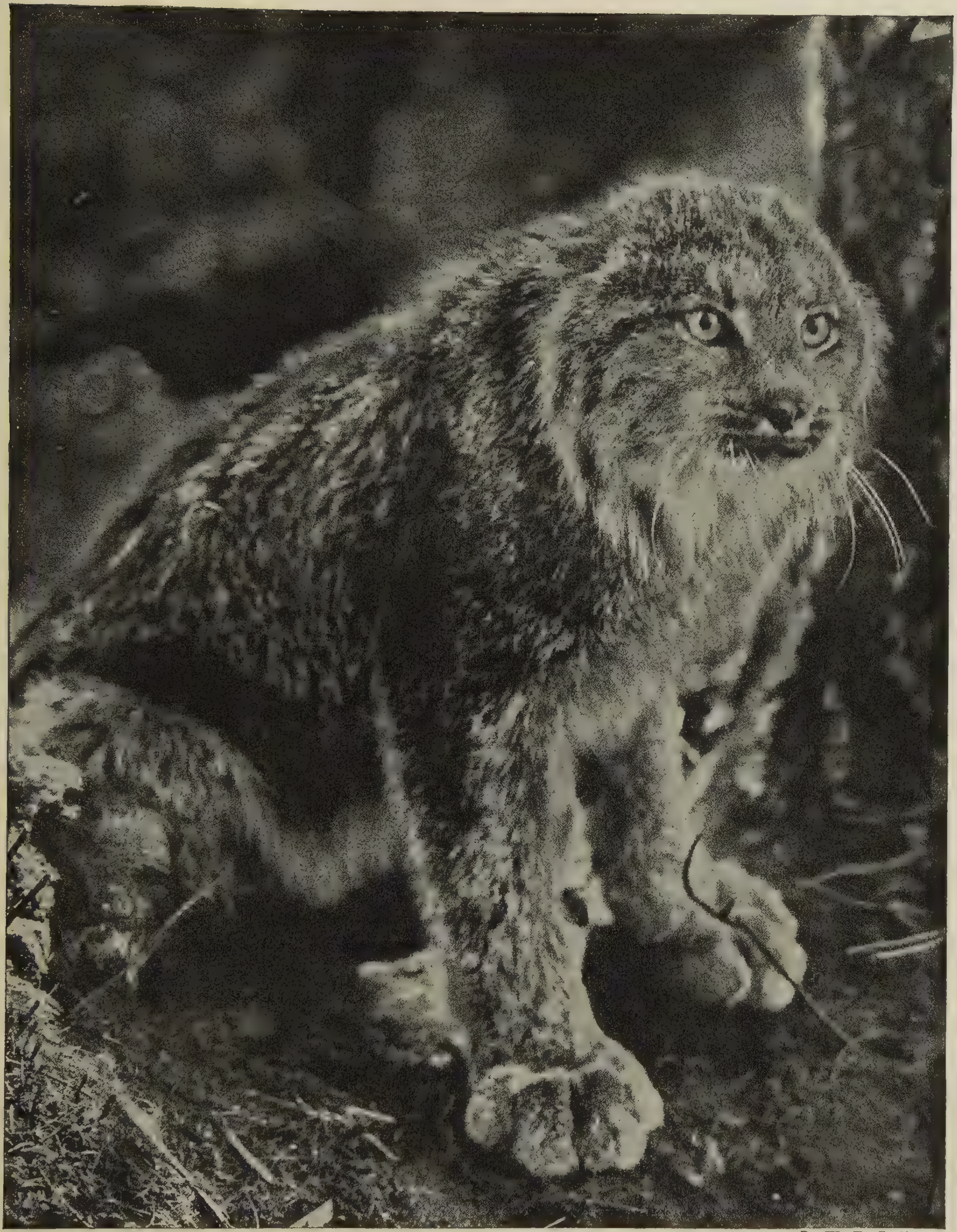
My friend Finley was severely clawed by one in crawling after it into a cave to get a flashlight photograph of the beast.

The Canada Lynx. "In the northern woods," says the author of "American Animals," "the lynx travels with silent leaps, his broad paws supporting him on the snow, or alighting without a sound among brittle twigs or dry leaves of a past summer, enabling him to pounce on grouse or hare before they have time to take alarm. He can also climb trees with ease, to rob the nests of birds and squirrels, or stretch himself along a lower branch from which he can launch himself on whatever may pass beneath. Yet since every creature that he hunts is equally well fitted for the contest, and even more earnest and watchful in its endeavors to avoid him and so enjoy its own wild life in the woods a little longer, the lynx must necessarily go without food often for days together in the winter, glad enough perhaps to pull some frozen scrap of flesh or skin out of the snow, dropped there by more fortunate hunters weeks before. The lack of insect scavengers is not felt in the woods in winter. The lynx appears to have its summer home in tangled thickets and snarls of young growth, where the interlocking branches of fallen trees afford protection. Here the ill-natured kittens are raised and taught to hunt, so that when the bitter struggle of winter is forced upon them they may, if possible, hold their own and prolong their lives at the expense of others, in order that their race may live. They hold on to life grimly through long, cold nights in the dark northern forests, believing somehow that at last spring will be in the woods again, bringing flight birds from the south, and awakening the small creatures that sleep all winter down deep in the frozen earth where the most desperate lynx can never reach them. Until then the lynxes must hunt as best they can, tireless and in splendid health, and quite unconscious of the cold, but oh, so hungry!

"One of the most astonishing facts in Nature is the length of time that most flesh-eating animals can go without food; on long hunts through deep snow, night after night, breathing frozen air that drives a man hungry soon after the heartiest meal, they maintain their strength, ready for a desperate struggle when at last the long pursuit draws to a successful end."

The Mongoose. You have all read Kipling's story of "Rikki-tikki-tavi," the best story Kipling ever wrote, I think, even if it is of a little mongoose and printed in "The Jungle Book" — a boy's book! You have n't read it? Do it then at once, for we have no mongooses in our country and I can't stop here over them, though they are found in many parts of the world, are of many species, and as killers of deadly snakes are among the best of the friends of man. The creature was worshiped in Egypt — the one animal god of the old Nilers that really deserved it. The civet cats are also members of this family; and close to them come the three species of hyenas.

Weasels, Otters, Badgers. Mustelidæ Family. Our native fields and wild forests are noted for their fur-bearing animals, among which this family of the weasel tribe figures most prominently. It would be hard to find a group of the smaller wild animals that are so savage, and some of them, too, so untamable, so appealing to the imagination, as these. They vary greatly in outward appearance, but in skeleton, etc., they are very closely related.



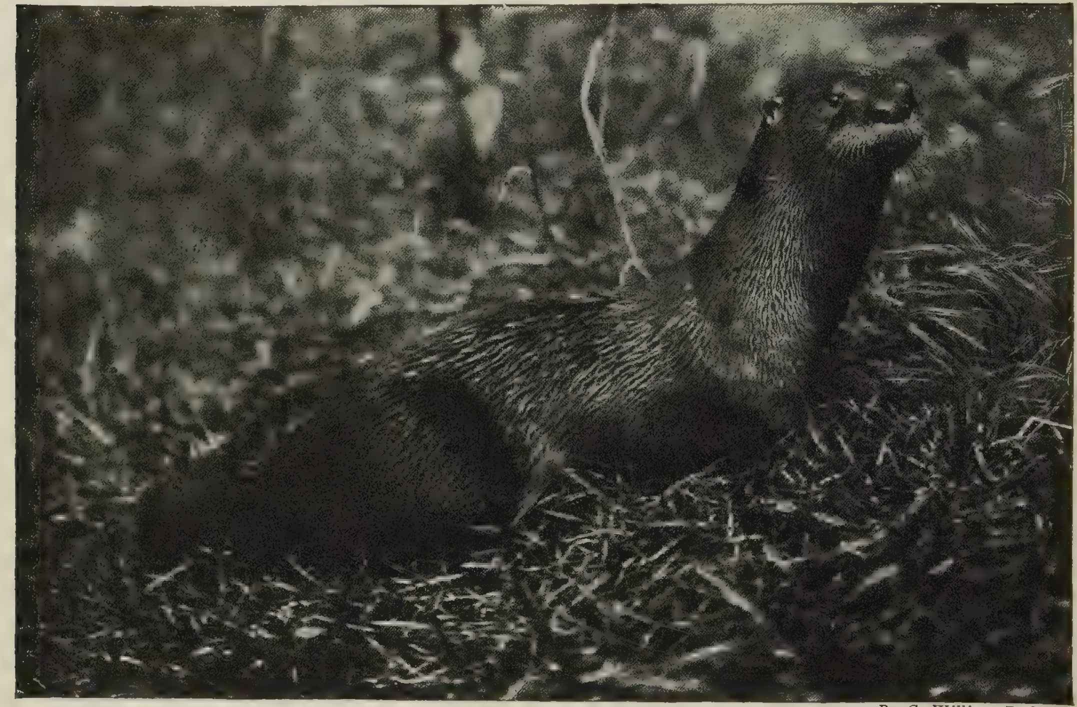
By W. E. Carlin

CANADA LYNX (*Lynx canadensis*)

This photograph was taken while the animal was brought to bay by fox terriers.

One of the largest of the group is the seal-like otter, now a rare animal in most parts of the United States, but common enough in Canada. The creature has a long, lithe body, stout legs, and webbed toes; powerful jaws with bristly, walruslike whiskers; and a thick tail, very broad and flat at the base. It is about three and one half feet long and of a uniform seal-brown color.

You would not want to fight such a beast unarmed. Yet bloodthirsty and savage as it is, the otter is at the same time the most playful of grown-up animals, so that, as Mr. William T. Hornaday of the New York Zoölogical Park says, a single otter is worth more to a zoo than a score of beavers, because of its amusing habits. One of its well-known tricks is sliding, or "tobogganing." In winter, when the animal is in a hurry, it has a way of making a few leaps and then hurling itself forward on its belly over ice or snow, especially down an incline. But often they will slide like this just for the joy of it.



By C. William Beebe

OTTER (*Lutra canadensis*)

A very difficult animal to photograph. This picture represents a great amount of work and a number of attempts.

"Their favorite sport," says Godman, "is sliding, and for this purpose in winter the highest ridge of snow is selected, to the top of which the otters scramble, where, lying on the belly, with the fore feet bent backwards, they give themselves an impulse with the hind legs and swiftly glide head foremost down the declivity. This sport they continue, apparently with the keenest enjoyment, until fatigue or hunger induces them to desist."

The large sea otter of the northwest coast, which has become almost a seal in his habits, is so rare and its fur so fine that it is now the most prized of all fur bearers.

"The sea otter mother sleeps in the water on her back," writes Stone,[1] "with her young clasped between her fore paws. The pup cannot live without its mother. Their food is almost entirely composed of clams, mussels,

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[1] In "American Animals."

By W. E. Carlin

A SKUNK (*Mephitis putida*) CROSSING A STREAM

and sea urchins, of which they are very fond and which they break up by striking the shells together, held in each fore paw, sucking out the contents as they are fractured by these efforts. They also undoubtedly eat crabs and fish and the juicy, tender fronds of kelp. They are not polygamous, and more than one individual is seldom seen at a time when out at sea. They are playful, it would seem, for I am assured by several old hunters that they have watched the sea otter for half an hour as it lay upon its back in the water and tossed a piece of seaweed in the air from paw to paw, apparently taking great delight in catching it before it could fall into the water."

The Skunk. "Less said, soonest over." I once published a story called "The Scarcity of Skunks" (see "The Face of the Fields") and one of my readers in New Jersey sent me this limerick:

"There was a young man from the city
Who met what he thought was a kitty;
He gave it a pat
Said, 'Nice little cat!'
Then they buried his clothes — What a pity!"

Did you ever meet a skunk? What a pity! Did you lose the whole suit — jacket and all? What a pity! To me he is of perennial interest, and the one common beast of my fields and woods. Every night I know by the wind that he is abroad, and must watch my chickens continually, for he is very fond of chicken! So am I.

He is about two feet in length, with a body covered with long hair. His tail is very large and bushy; his color black with a white patch on the back of the neck, from which two stripes extend down the back and along the sides to the tail, and a white stripe down the forehead. Sometimes the white is almost restricted to the patch on the neck, and in the other specimens the stripes are united, making the whole back white.

The skunk, however, is one of the best mousers and insect eaters that we have. Mr. M. F. Matheny, writing in "Forest and Stream," gives us this vivid and altogether curious description of the animal's hunting habits:

"All agree that the skunk is the natural enemy of insects, and it is for this reason that the farmers in a great many agricultural districts have secured legislation for his protection; but did you ever think what ingenuity is employed by the little fellow in the capture of his prey? Does he charm like the snake, does he lie in wait, or does he provoke them to assault? It is the latter. A skunk can catch any insect that he can get to fight him. On the occasion referred to I went to the woods in quest of squirrels. It was a warm, cloudy afternoon in September. While standing on a log waiting for a squirrel, I saw a large object moving through the weeds toward me, which I first took to be a gray fox. I raised my gun and prepared to shoot, but as the animal advanced I noticed that it was not a fox, but a skunk, and the largest I had ever seen, his color being very much like that of a gray fox. When he first saw me he was about twenty steps away, but instead of making an effort to retreat he rose on his toes, fluffed up his hair and tail, and jumped up two or three times, lighting on the ground stiff-legged, after the fashion of a sheep on the entry of a dog to the barn lot, at the same time hissing and blowing as a mad house cat will do. I kept him covered all the time with my gun.

"In a few minutes his anger seemed to subside; he then walked a few feet away, and with his left paw he made a few quick digs in the leaves, and then turning around began to slowly switch his tail over the place where he had scratched. At each movement I became more and more interested, and watching I saw a swarm of yellow jackets emerging from the ground. Hot and furious they darted at the little fellow's tail, which was kept constantly in motion, each one sticking tight to the long fur and doing no damage. I never shall forget his keen black eyes as he looked at me as if to say, 'Watch me; I have done it before.'

"With a tail covered with jackets, like so many burs, he walked a few feet away and began to pick them off and eat them as a hungry boy would so many berries. This act repeated once more, the little yellow warriors were gone, and their home, left defenseless and desolate, was dug out and carried away by the victor, who left apparently without any fear

HALFWAY ACROSS

that I would do him harm. And I, then a boy, now grown to manhood, am glad that I did not shoot."

In the South you will find a tiny little striped skunk, whose habits in all respects are like his larger brother. This is called the "phoby cat," from the fact that it has been known to bite sleeping hunters in the hands and give them hydrophobia.

The Badger. Here on the coast I never saw a badger; but on the plains of the West, especially in the sagebrush deserts, they are as plentiful as woodchucks.

Of the habits of the creature Mr. Ingersoll says: "The badger is truly a 'beast of the field,' — digging or stealing underground holes, and preying upon everything it can catch or conquer. Its body is two feet long, extraordinarily low-nung and broad, and when it is curled up asleep, and its long fur is erect, it looks like a well-stuffed cushion. The legs are short and firm, and the large feet are furnished with long and very strong claws, making them powerful digging tools. The head is broad, massive, and doglike, with round, furry ears, a hairy muzzle, and jaws filled with formidable teeth, scarcely less terrible than those of the wolverine. The whole squat, compact, large-boned, massively skulled form indicates great muscular power; and it is controlled by a capable brain and an indomitable spirit. . . . The loose fur is a 'grizzle of blackish, with white, gray, or tawny,' each hair having all these colors on some part of its length, and the whole blending handsomely.

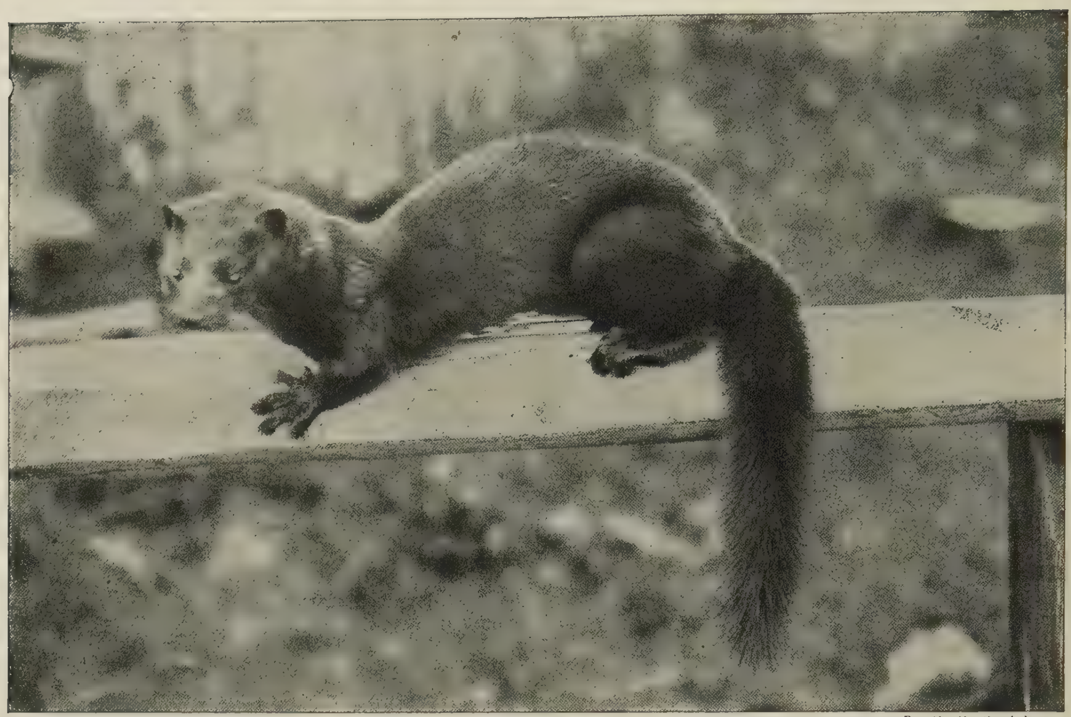
"The badger feeds upon whatever animal food he can kill or catch that is not carrion — principally the ground squirrels, gophers, and field mice among which he lives. It is beyond his ability to chase and catch these nimble fellows, for the badger is slow and clumsy; but it is the work of a very few minutes for this vigorous miner to so far enlarge their burrows that it can reach the deepest recesses. His hunting is at night.

"The entrance to its own burrow is large, and the tunnel reaches below the frost line, and may be almost any length. The animal changes its abode frequently, and constantly digs more holes than it needs, thereby saving a good deal of labor for coyotes, foxes, ferrets, snakes, owls, etc., which take possession of its abandoned intrenchments. Godman tells us that three or four young are born in summer, and that the period of life may reach fifteen years. In the United States the animal is more or less active all winter, being able to search out or dig out enough sleeping ground squirrels, marmots, etc., in spite of the frost, to satisfy its needs if not its appetite. Farther north, however, the greater cold and enforced famine induce or compel it to pass in semi-torpidity the more severe months."

The Weasel and the Mink. I will put these two relatives together, for in many ways an account of one will also tell the other's story. Every reader of this book knows the character of the weasel, how it stands for blood and slaughter for the pure wanton sake of blood and slaughter — the most terrible "spirit" of the woods. Were he big enough he would start in with a village of men and cut every throat for the sake of killing. I count him the hardest character, the most vicious, the most defiant and daring of all the animals I know.

To show how cool and defiant he can be let me describe my meeting with one on a Christmas day in the woods near Bridgeton, N. J. I had been watching some fox sparrows bathing in the snow water, and, as I sat studying the various signs in the snow, my eye caught a tiny trail leading out from the others straight away toward a broken pile of cordwood. The tracks were planted one after the other, so directly in line as to seem like the prints of a single foot. "That's a weasel's trail," I said, "the death's-head at this feast," and followed it slowly to the wood. A shiver crept over me as I felt, even sooner than I saw, a pair of small, sinister eyes fixed upon mine. The evil-pointed head, heavy but alert, and with a suggestion of fierce strength out of all relation to the slender body, was watching me from behind the sticks of cordwood. And so he had been watching the mice and birds and rabbits feasting under the tree!

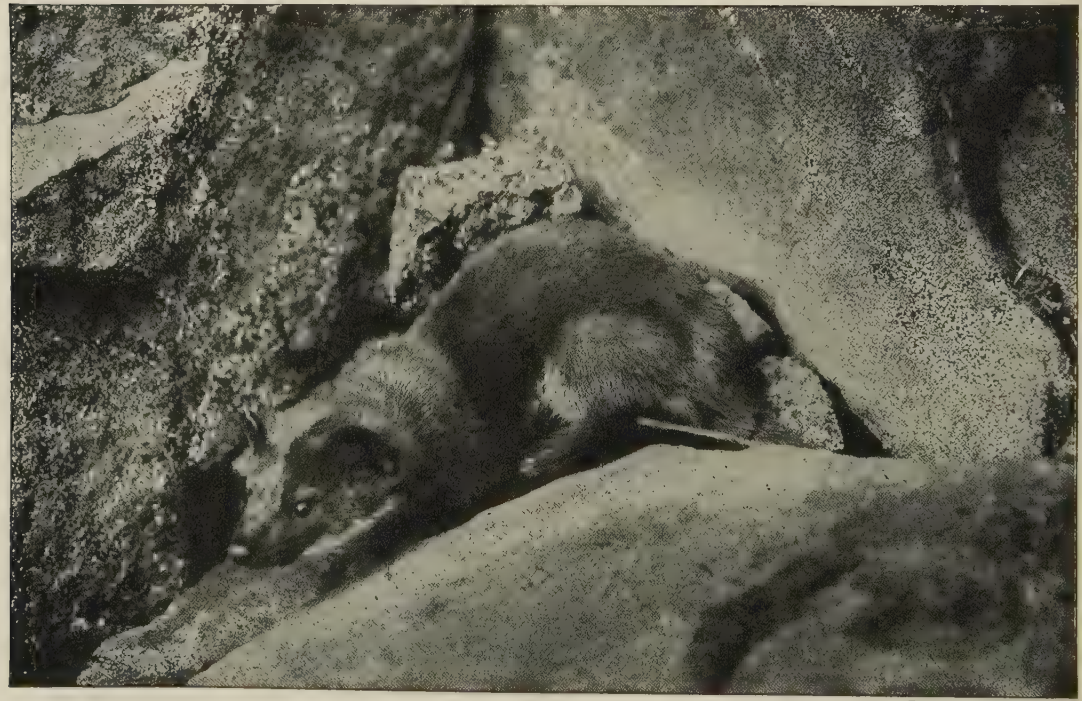
I packed a ball of snow round and hard, slipped forward upon my knees and hurled it. *Spat!* It struck the end of a stick within an inch of the ugly head, filling the crevice with snow. Instantly the head appeared at another



By C. C. Speight

MINK (*Putorius vison*) TWENTY-ONE INCHES LONG

Color, nearly black, with chin white.



By W. E. Carlin

WEASEL (*Putorius noveboracensis*)

Caught by the camera as he reappeared after being chased into his hole in the rocks. It is about sixteen inches long. Color, dark chocolate-brown above, white on under parts, terminal third of the tail black. In winter pure white except the black of the tail. This change in color is complete only in the northern part of its range.

crack, and another ball struck viciously beside it. Now it was back where it first appeared, and did not flinch for the next, nor the next ball. The third went true, striking with a *chug* and packing the crack. But the black, hating eyes were still watching me a foot lower down.

The picture shown here was taken of the animal *after* it had been driven into its hole. How? Why, the beast came right out again. You cannot drive a weasel.

The mink is much larger than the weasel. It can swim like an otter, climb like a marten, hunt a hole like a ferret, and generally adapt himself to times and places as few other creatures can.

"The mink is not properly either nocturnal or diurnal; when well fed and tired, after a hard chase, he turns in and sleeps until rested, and then yawns and stretches himself and starts out again for another jolly hunt, perfectly indifferent to the time of the day. It may be black, rainy midnight or a brilliant October morning. When he wakes, off he goes, hungry and eager for fresh adventures, exploring unknown territory and chasing birds such as he has never seen before, as the northern cold drives them down in flight before it. His first snowstorm is likely to find him dozens of miles from home. Now and again he runs across other members of his species and the two hunt and fish together for a few days, but they soon part company again in most instances, one, it may be, preferring to follow down along the tidewater creeks after eels, while the other anticipates better fun chasing partridges and squirrels in the upland woods."[1]

In the winter they used to come into the marshes along the Maurice River and rob our muskrat traps, cleaning up trap after trap in a single night, leaving only the foot of the poor rat to tell the story; but what *one* mink (if it were one) could do with three or four muskrats of a single night — I have never found out.

The Pine Marten. My children and a woodchopper were witnesses recently of an exciting, and, for this section of Massachusetts, a novel race, which, but for them, most certainly would have ended fatally. The boys were coming through the wood lot where the man was chopping, when down the hillside toward them rushed a little chipmunk, his teeth a-chatter with terror; for close behind him, with the easy, wavy motion of a shadow, glided a dark, brown animal, which the man took on the instant for a mink, but which must have been a large weasel or a pine marten. When almost at the feet of the boys, and about to be seized by the marten, the squeaking chipmunk ran up a tree. Up glided the marten, up for twenty feet, when the chipmunk jumped. It was a fearfully close call.

The marten did not dare to jump, but turned and started down, when the man intercepted him with a stick. Around and around the tree he dodged, growling and snarling and avoiding the stick, not a bit abashed, stubbornly holding his own, until forced to seek refuge among the branches. Meanwhile, the terrified chipmunk had recovered his nerve and sat quietly watching the sudden turn of affairs from a near-by stump.

The marten is about two feet long, and might easily be taken for the fisher except for its size. The fisher is three feet long, and except for the wolverine, the largest of his tribe. There is nothing that the fisher is afraid of; it is even said to kill young grizzly bears.

"The fisher's private hunting grounds are gloomy hemlock and spruce-covered hills and ridges, where they cover immense distances in a single night, traveling by bounds, nose in the air, to catch every scent that is in the wind."[1]

The Wolverine or Glutton. According to the tales of trappers this is the craftiest, most gluttonous thing that haunts the northern forests. It is about thirty inches long.

It is heavy and bearlike and walks on the soles of its feet. Its hair is long and shaggy, and the general color blackish-brown, lighter on top and sides of the head; feet black; a pale yellowish-white band from the middle of the body on each side widens out on the flanks and joins over the basal portion of the tail. The fur is of great value, but the wolverine itself is a most unlovable brute, sullen and greedy.

In many respects he is like the skunk — lazy, fat, and cunning beyond belief, stealing from man and beast, making everyone his enemy.

"The wolverine's own home is a burrow, and here in midsummer the five or six little wolverines are born; they are somewhat lighter colored and more attractive than their parent, who shows her one admirable trait in her affection for them and her fearless attacks on any man or beast that threatens their safety.

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[1] "American Animals."

"When I think of the wolverine I always seem to see him through distant openings in low, dark northern forests, where the pointed spruce trees thin out at the edge of the barren, and the dull snow-threatening winter sky hangs close over the endless snow beneath; not even the little blue fox or musk ox seems more suggestive of the northern cold."[1]

Br'er Coon. I hope you will read "Mux" in "Roof and Meadow," not because I wrote it, but because the story tells much of the ways of the raccoon and how *one* raccoon "got even" with a certain big tomcat.

The raccoon ("coon" is only a corruption) is, as one writer calls him, a "little brother to the bear." Its washing habits, its increase in spite of cities (I have hunted it within ten miles of Camden, N. J.), its bearish ways and monkeylike habits make it a most interesting animal. Do you know the story of "How Sandy Got His Meat"? It is one of Uncle Remus's Tar Baby stories, and one you ought to know. You will easily tell the coon's track, for it looks like a baby's, but you will not see it in the snow, unless the old fellow is *forced* out, for a coon hates snow. He will invariably sleep off the first light snowfalls, and even in the late winter he will not venture forth in fresh snow unless driven by hunger or some other dire need. Perhaps, like a cat or a hen, he dislikes the wetting of his feet. Or it may be that the soft snow makes bad hunting — for him. The truth is, I believe, that such a snow makes too good hunting for the dogs and the gunner. The new snow tells too clear a story. His home is no inaccessible den among the ledges, only a hollow in some ancient oak or tupelo. Once within, he is safe from the dogs, but his long, fierce fight for life taught him generations ago that the nest tree is a fatal trap when behind the dogs come the ax and the gun. So he has grown wary and enduring. He waits until the snow grows crusty, when without sign, and almost without scent, he can slip forth among the long shadows and prowl to the edge of dawn.

The Big Bears. "Bears are massive, clumsy beasts, with thick limbs, big, strongly clawed, plantigrade, naked-soled feet, and an ability to take the world as they find it," says Ingersoll, and we quite agree with him, especially when *we* are the world and the bear is a grizzly.

"Bears are lazy, slow, and solitary, the males usually wandering by themselves and likewise the females, accompanied by cubs. The two young are born in midwinter in the den, a rocky cave, a hollow tree, or only a bed beneath the snow. The cubs are small, naked, blind, and very slow to develop; the mother is extremely careful of them, and heedlessly brave in their defense. An unprovoked attack by a bear is pretty sure to be by a mother who sees or fancies her babies in danger."

The Polar Bears. The far northern bears live largely on fish, walruses, and seals. When the polar bear has hunted down a seal which is basking on the ice, he at once slips quietly into the water and swims toward his prey, allowing only his nose to come to the surface at intervals for breathing. When just in front of the seal, he rises out of the water and makes a quick pounce. The seal rarely escapes.

Here is a picture by an eyewitness of how the polar bear catches salmon:

"The bears do not get all their fish in shallow water or on bars and riffles in small streams, but often go into comparatively deep water in large streams. Nearly all this kind of fishing is done at night or very early in the morning, although their habits in this respect have probably changed in recent years, as they have been very much hunted. The cubs do not attempt to fish, but stay on the bank and devour the fish that their mother throws out to them. The mother bear stands upright and wades in the water, sometimes up to her neck, walking very slowly downstream, watching the water, and making scarcely a ripple in it. She holds her front legs down at her sides with her paws spread, and when she feels a salmon coming up against her she grasps it with her claws and tosses it out on the bank to the waiting cubs. Often she stands perfectly motionless for a considerable time, and when she moves, it is

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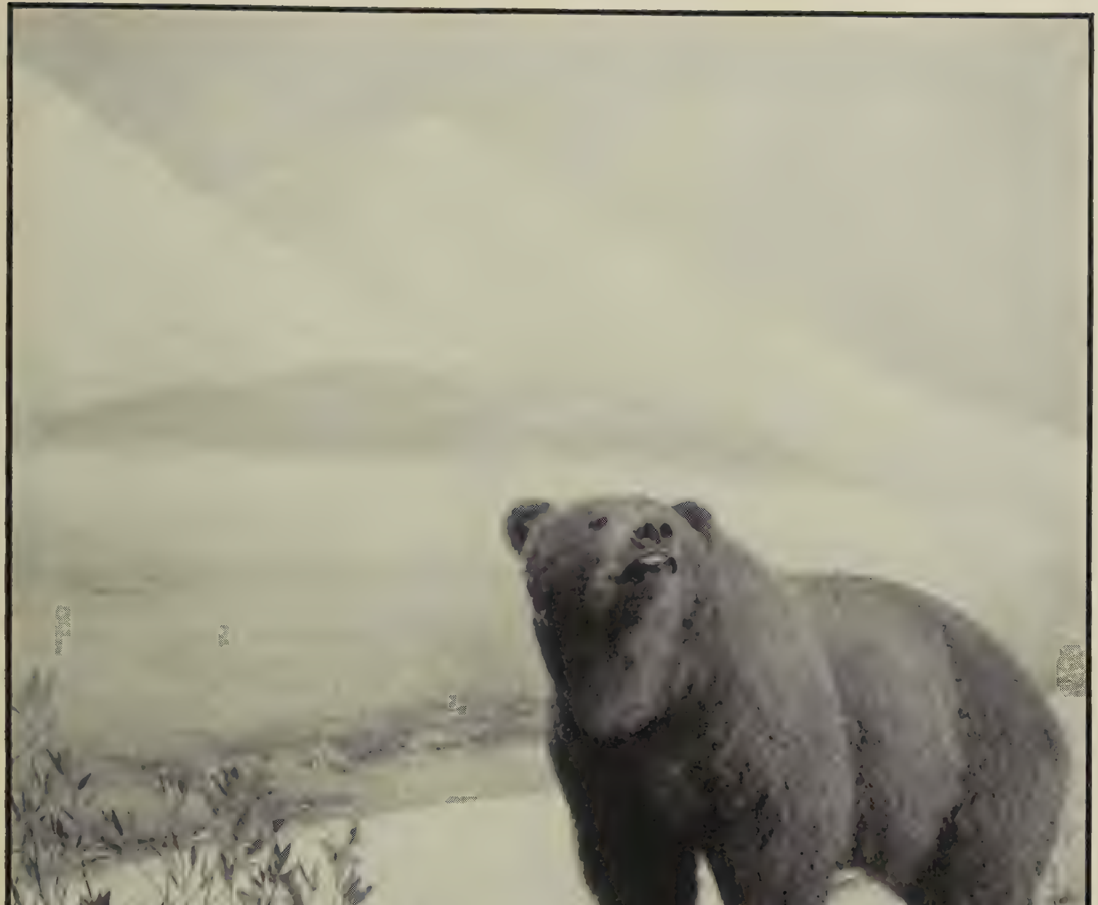
[1] "American Animals."



Field Museum of Natural History, Chicago

KADIAK BEARS OF ALASKA

By A. R. Dugmore

POLAR BEAR (*Thalarctos maritimus*)

with extreme deliberation and caution. When the cubs have all been supplied, she puts the next fish in her mouth and wades ashore to eat it. When the polar bear fishes in shallow water, he walks slowly on all fours as silently as possible, and when a fish appears near him, he strikes at it with a sharp blow on the head."

The main food of all the bears is not, however, flesh, but fruit, berries, roots, bark, lichens, and tender shoots. "When blueberries are ripe, the black bear searches out the region where they grow the thickest, and there he eats to his heart's content. He loves the wild grape also, and the persimmon and pawpaw. Even the surly grizzly feeds in autumn mainly on fruits — accumulating fuel to keep the fire of life burning during his long winter sleep."

"The hibernation of the bear is a matter of necessity," says the author of "Life of Animals," "depending upon climate, ability to get winter food, and the need of rest. In very cold and snowy countries the females 'den up' early and may be snowed under for weeks. They do not go into torpidity but simply lie quietly, subsisting on their accumulated fat, the slow assimilation of which sustains their own life, and enables them to nurse the babies which are born during this winter retirement. It is thus the female ice bear passes the cold months, but the males are abroad during all the long, dark, polar night, even as far north as men have ever gone. In the case of other northern species the males also hibernate, each by itself, but are liable to come out from time to time."

In our own country we have, besides the great grizzly, the still greater Kadiak bear — a foot larger than the grizzly.

This enormous bear and the allied Yakutat and Sitkan bears are restricted to Alaska and adjacent islands. They present differences of structure from both the grizzly and black bears and are larger than either, and larger than any of the brown bear group. Here also are the black, brown, and, in the north, the white or polar bears, some twelve or fourteen varieties all told. The bears of the Old World play as large a part in the wild life there as they do here.

Personally I have met but one wild bear in the woods, and I ran one way while he ran the other; but aside from the grizzly they are all peaceably inclined and more than ready to let you alone. That is true of the grizzly too, as those in the Yellowstone National Park clearly show.

Foxes and Wolves and Dogs. About my home in New Jersey there was only an occasional gray fox, whereas here in Massachusetts there are no gray ones, but plenty (more than plenty, seeing them from the hen-yard gate) of red ones. The habits of both are much alike, and too well known for me to stop long over them here. The gray fox does not "earth," but dens in hollow logs, and being less sought after and less conspicuous ought to thrive more than the red one; but the contrary seems to be true. He lacks the keen wit, and so keeps back in the deep forest.

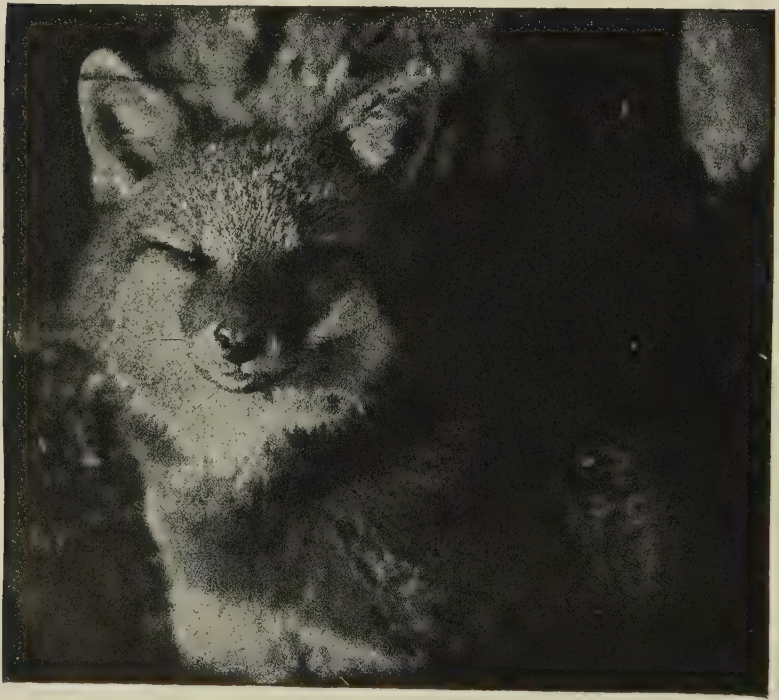
Not so does sly old Reynard! Last night, and the night before, the hounds brought the red fox loping along his trails through the woods about me here. What a run it is! Poor little fox!

"No, don't say, 'Poor little fox!' For many a night I have bayed with the pack, and many a night I have loped and dodged and doubled with the fox, pitting limb against limb, lung against lung, wit against wit, *and always escaping*. More than once, in the warm moonlight, I, the fox, have led the dogs, on and on, spurring their lagging muscles with a sight of my brush, on and on, through all the moonlit night, through all the day, on into the moon again, and on until — only the stir of my own footsteps has followed me. Then, doubling once more, creeping back a little upon my track, I have looked at my pursuers, silent and stiff upon the trail, dead! and, ere the echo of their cry has died away, I have caught up the chorus and carried it single-throated through the wheeling, singing spheres.

"Of course this is my own imagination, but there is more of fact than of fancy to it. That a fox ever purposely led a dog to run to death would be hard to prove; but that the dogs run themselves to death in a single ex-

Courtesy of American Museum of Natural History

HEAD OF POLAR BEAR



By H. K. Job

GRAY FOX (*Urocyon cinereoargenteus*)

RED FOX

tended chase after a single fox is a common occurrence here in the woods about the farm. Occasionally the fox may be overtaken by the hounds; seldom, however, except in the case of a very young one or of one unacquainted with the lay of the land, a stranger that may have been driven into the rough country here.

"I have been both fox and hound; I have run the race too often not to know that both enjoy it at times, fox as much as hound. Some weeks ago the dogs carried a young fox around and around the farm, hunting him here, there, everywhere, as if in a game of hide-and-seek. An old fox would have led the dogs on a long coursing run across the range. But the young fox, after the dogs were caught and taken off the trail, soon sauntered up through the mowing field behind the barn, came out upon the bare knoll near the house, and sat there in the moonlight yapping down at Rex and Dewy, the house dogs in the two farms below. Rex is a Scotch collie, Dewy a dreadful mix of dog dregs. He had been tailender in the pack for a while during the afternoon. Both dogs answered back at the young fox. But he could not egg them on. Rex was too fat, Dewy had had enough; not so the young fox. It had been fun. He wanted more. 'Come on, Dewy!' he cried. 'Come on, Rex, play tag again! You 're still it.'"[1]

The Arctic Fox. Most beautiful of all the family, and most interesting too in his strange polar habits, is the little kit fox, who lives in communities in the arctic north, where it packs away in cold storage its supply of lemmings for the winter.

The Coyote or Prairie Wolf. You will find in a book of mine called "Summer" the story of "The Coyote of Pelican Point," a sagebrush-desert coyote that for years had been more than a match for the game warden who had the birds of the region in charge. It was a rattlesnake and a pair of greyhounds and the trick of a professional hunter combined that finally brought him low! Ah, but he is a wise dog! And the very sight of him in the distance, loping off from the margin of an alkali pond, where he had been feasting on a dead calf,

TIMBER WOLF

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[1] From "The Lay of the Land." By permission of Houghton Mifflin Company.

By A. R. Dugmore

COYOTE (*Canis latrans*)

put the whole desert in motion with wild, fierce life for me! He is only a little larger than a fox, of grizzled desert-gray, with a black-tipped tail, and in his movements the very spirit of the wild, withholding desert. The coyote burrows in the plain, often taking a badger's hole, where in the spring its half-dozen pups are born.

"When out after jack rabbits two coyotes usually work together. When a jack rabbit starts up before them, one of the coyotes bounds away in pursuit while the other squats on his haunches and waits his turn, knowing full well that the hare prefers to run in a circle and will soon come round again, when the second wolf takes up the chase and the other rests in his turn. In this manner the jack is finally tired out and overtaken. When some particularly shy old jack rabbit starts off for a straightaway run instead of circling, the coyote in pursuit tears away to one side and generally succeeds in turning him back toward the spot where the other wolf is waiting.

"It is a well-known fact that a coyote will follow a trapper or a party of roving Indians, picking up the scraps left about their camp fire, or wherever they may have been skinning game. If unmolested at such times, he soon loses much of his native wildness and exhibits considerable boldness."[1]

The Great Gray Wolf or Timber Wolf. The gray or timber wolf that formerly roamed in packs over most of North America is now extinct in the United States east of the Mississippi River. The exact number of varieties of American wolves we do not know. The black wolf, which still exists in the Florida Everglades, is a distinct species, perhaps, and also the arctic wolf, which is pure white with a black tip to the tail.

It seems strange that wolves may still be a menace in such old countries as France and Germany, while here in wild broad America, except in the almost unexplored north, they are almost extinct.

They are roving beasts, especially in winter, great bands of them coming together for hunting. A wiser animal does not roam the woods. If you wish to read the best of wolf stories, take the tale of "Lobo" by Ernest Thompson Seton.

The Domestic Dogs. The pedigree of the domestic dogs is lost in the dim, dim past. Men have always had dogs, or dogs have always attached themselves to men. Only the South Sea Islanders, among all native tribes in every part of the globe, are without dogs. The Bible contains about forty references to the dog and the ancient Egyptians and Assyrians carved pictures of domestic dogs on their monuments and tombs.

Following his masters footsteps wherever they may lead, satisfied always with what satisfies his master, the dog has lavished on man a measure of affection even greater than man has given him in return.

The pictures of dogs on the two following pages and in Volume Nine, beginning with page 386, will show how diversified are the modern breeds of dogs and how far from their wolfish ancestors they have developed.

Courtesy of American Museum of Natural History

CAPE HUNTING DOG OF SOUTH AFRICA (*Lycaon pictus*)

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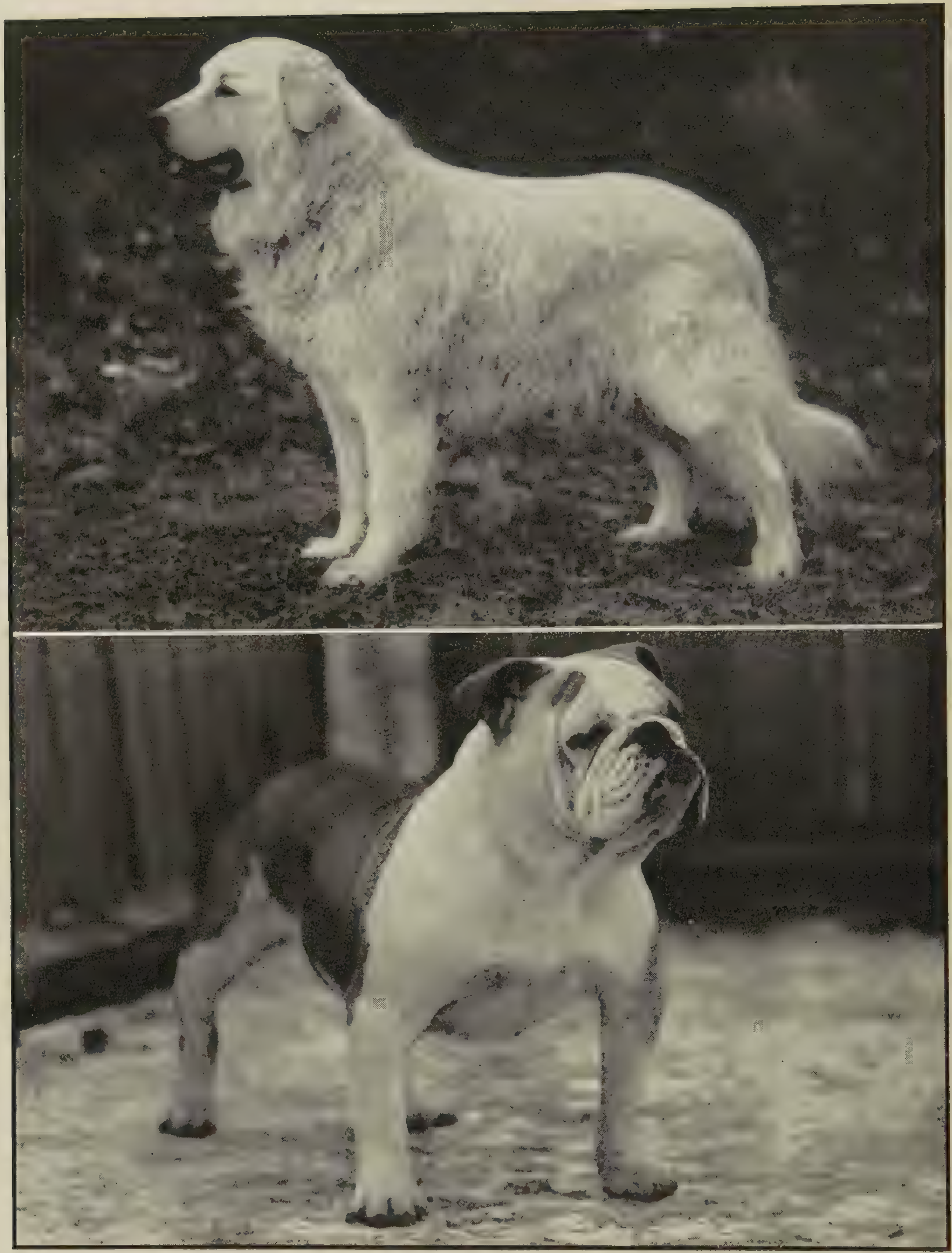
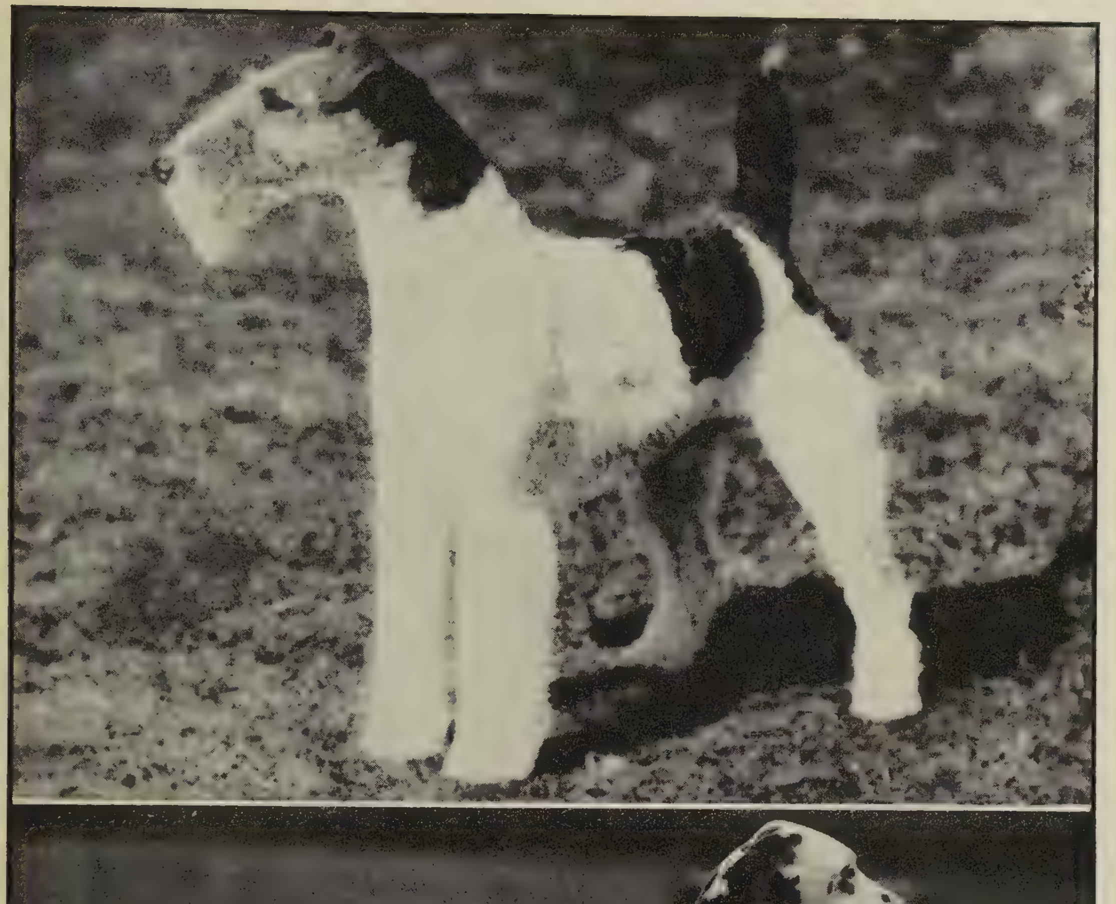
[1] "American Animals."



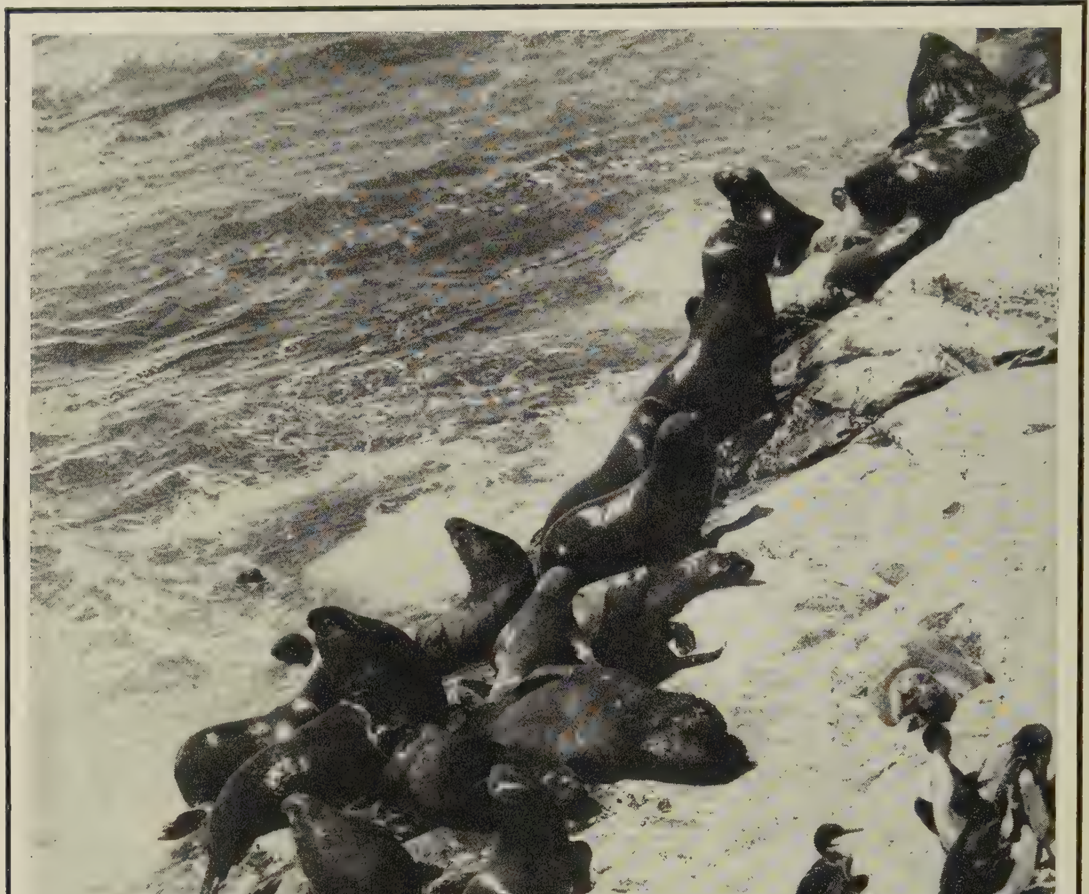
Photos, top, Basquaerie Kennels; bottom, Mr. George Lockwood

ABOVE: A GREAT PYRENEES   BELOW: A BULLDOG



Photos, top, Mr. Joseph W. Viner; bottom, Tally-Ho Kennels

ABOVE: A WIRE-HAIRED FOX TERRIER   BELOW: A DALMATIAN OR "COACH DOG"



Ewing Galloway

SEALS AND CORMORANTS ON ROCKY ISLANDS OFF THE COAST OF PERU

Courtesy of Field Museum of Natural History, Chicago

WALRUSES

SEALS, WALRUSES, AND OTHER BEASTS OF THE SEA

THREE suborders of marine carnivores are found along our shores: the eared seals, with hind flippers that can be turned, the walruses, and the seals whose hind flippers are directed backward and used only for swimming.

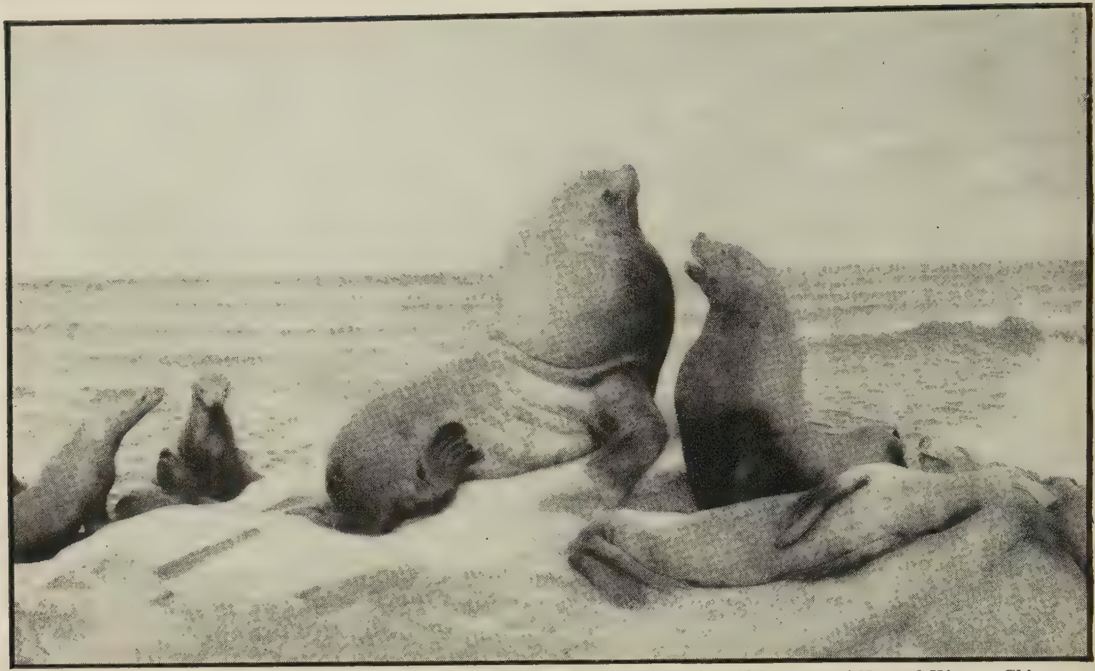
Among these the largest, with the exception of the sea elephant, is the walrus — monster beasts that feed on the bottoms under shallow water where they grub up shellfish.

Like the fur seal, the walrus is most commonly found in Arctic regions. The Atlantic walrus is at home on the shores of Labrador and Hudson Bay; the Pacific walrus on the coast of Alaska and the islands of the Bering Sea. Unlike the seals, sea lions and sea elephants, the walrus, both male and female, has two large ivory tusks, sometimes as much as two and a half feet long, projecting downward from the upper jaw. The short broad muzzle is adorned with a moustache of stiff bristly whiskers which grow shorter and thicker in the older animals. A full-grown male walrus measures from 10 to 11 feet from the nose to the end of the short flipper-like tail and may weigh more than two thousand pounds.

Walruses live in herds and are usually found near the Arctic shores on large masses of floating ice, although occasionally they are seen far out in the open sea. The voice of the walrus is a loud roaring which has been described as "something between the mooing of a cow and the deepest baying of a mastiff."

The Sea Lions. Next to the walrus for size is the sea lion. It is an eared seal, like the fur seal, but is larger than the fur seal and its coat is of no value as fur. The sea lion of the North Pacific shores is much larger than the ones found along the coast of California and Mexico. The sea lion is intelligent and easily trained; many of the "trained seals" you may have seen in circus menageries or on the stage may have been sea lions.

During a visit which we once made to Three-Arch Rocks in the Pacific we studied the great herds, and captured a baby which we brought away. When we came down from the summit we camped for the night on a narrow ledge looking down upon the bed of an old bull sea lion — a great beast that must have weighed fifteen hundred pounds or more. As dusk came on down in the water below us, up rose the bulk of the old fellow, an old lone bull, whose den we



Courtesy of Field Museum of Natural History, Chicago

NORTHERN SEA LIONS

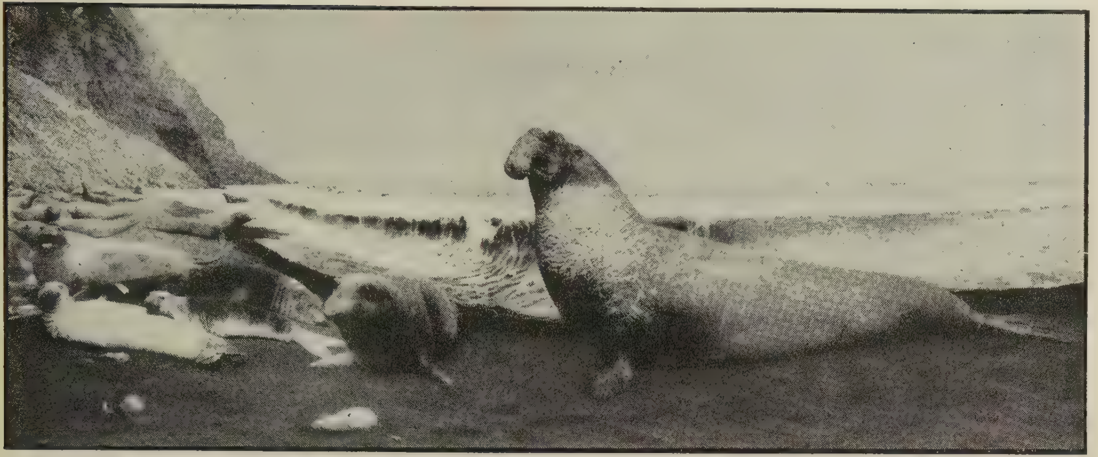
had invaded. He was coming back to his bed for the night. He rose and sank in the half light, blinking dully at the cask and other things that we had left below us on the ledge belonging to him. Then he slowly clambered out and hitched up toward his bed. My own bed was just above his, so close that I could hear him blow, could see the scars on his small head, and a long, open gash on his side. We were very near.

I drew back from the edge, pulled the blanket and sailcloth over me, and turned my face up to the slanting rain. But for a long time his blowing and groaning kept me, not exactly nervous, but far from feeling sleepy.

The Fur Seal. Indiscriminate killing of fur seals upon the high seas, known as pelagic sealing, was a grossly wasteful and cruel practice which for a time threatened the extinction of this valuable animal. When the United States acquired Alaska in 1867 the estimated seal population was five millions. By 1910 the herd had been reduced to an estimated one hundred thousand in spite of the fact that our government had carefully limited the numbers that could be killed on the rookeries of the Pribilof Islands. In 1911 pelagic sealing was prohibited by international treaties and since then the numbers have steadily increased. In 1938 the Pribilof herd numbered more than 1,850,000 seals. About 55,000 to 60,000 seals are killed each year, only the surplus three-year-old males or "bachelor bulls" being taken.

"The fur seal is a migratory animal, spending the summer and autumn in its breeding ground on the Pribilofs and passing the winter at sea, ranging down the coast as far as southern California. The females reach maturity at the end of their second year, while the males do not gain their full size and strength until seven years old. As in most gregarious and polygamous animals, this results in several distinct stages of growth, which are designated by the sealers by special names. There are the adult 'bulls' and 'cows,' as well as the new-born 'pups,' while the young males of three years are the 'bachelors' and the older ones the 'half bulls.'

"The summer life of the breeding ground or 'rookeries' as described by visitors is exceedingly interesting. About the first of May the old bulls begin to arrive and take up their



Courtesy of Field Museum of Natural History, Chicago

SEA ELEPHANTS

positions on the bleak, rocky beaches. By June the cows appear and as fast as they land are taken in hand by the bulls, each bull eventually surrounding himself by a 'harem' which he guards and rounds up, forcing back any cow that attempts to escape. The single pup is born shortly after the arrival of the cow, and as soon as it has become sufficiently strong to be left she repairs to the sea to feed, returning to it at intervals.

"Meanwhile the 'bachelors' and 'half bulls' arrive at the rookery, but herd by themselves and make no attempt to intrude upon the harems. The late-arriving bulls which fail to secure harems locate immediately behind their more fortunate rivals, and by their efforts to encroach upon adjoining harems or steal cows they continually precipitate desperate fights.

"The old bulls, which often for a space of two months have been forced to fast in order to maintain their positions in the rookery, begin to seek their feeding ground at sea about the middle of July. They are usually much emaciated as compared with their fat, sleek appearance at the beginning of the season, the great, thick coat of blubber having been absorbed to supply their bodies in lieu of food."[1]

The Vanishing Sea Elephant. Guadalupe Island, lying off the west coast of Mexico, is the place of shelter for the last herd of sea elephants known to exist.

"The sea elephant is an important link in the chain of evolution, and is the largest of all fin-footed animals," says a writer in the New York *Sun*. "The adult male is about twenty-two feet in length, and is about eight feet high when propped up on his front flippers in a natural position. These great bulls weigh from two to three tons, and have a trunk, or proboscis, which, when relaxed, hangs down over the mouth about two feet. In the end of this the nostrils are placed rather wide apart, and when they breathe, their whole mass trembles in tiny undulations to the very end.

"The flippers are thick, and tipped with heavy claws. There is a tail about one and a half feet long, separated horizontally in two divisions. This tail acts as a propeller, to assist the huge creature when it comes in through the breakers. He hoists his back flippers and tail so as to catch the full sweep of the waves, and then allows himself to be boosted up on the beach.

"Coarse, bristling hair grows sparsely from the back along the body, and a tough protecting crust of flesh reaches like a shield from the lower jaw down over the chest and round to the back of the neck. This biblike affair is Nature's provision for protection in time of battle. The males fight viciously in the mating season, and the chest protector prevents much loss of life."

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[1] "American Animals."

POLLY, A CHIMPANZEE

Field Mus. of Nat. Hist.

A MALE GORILLA

THE APES

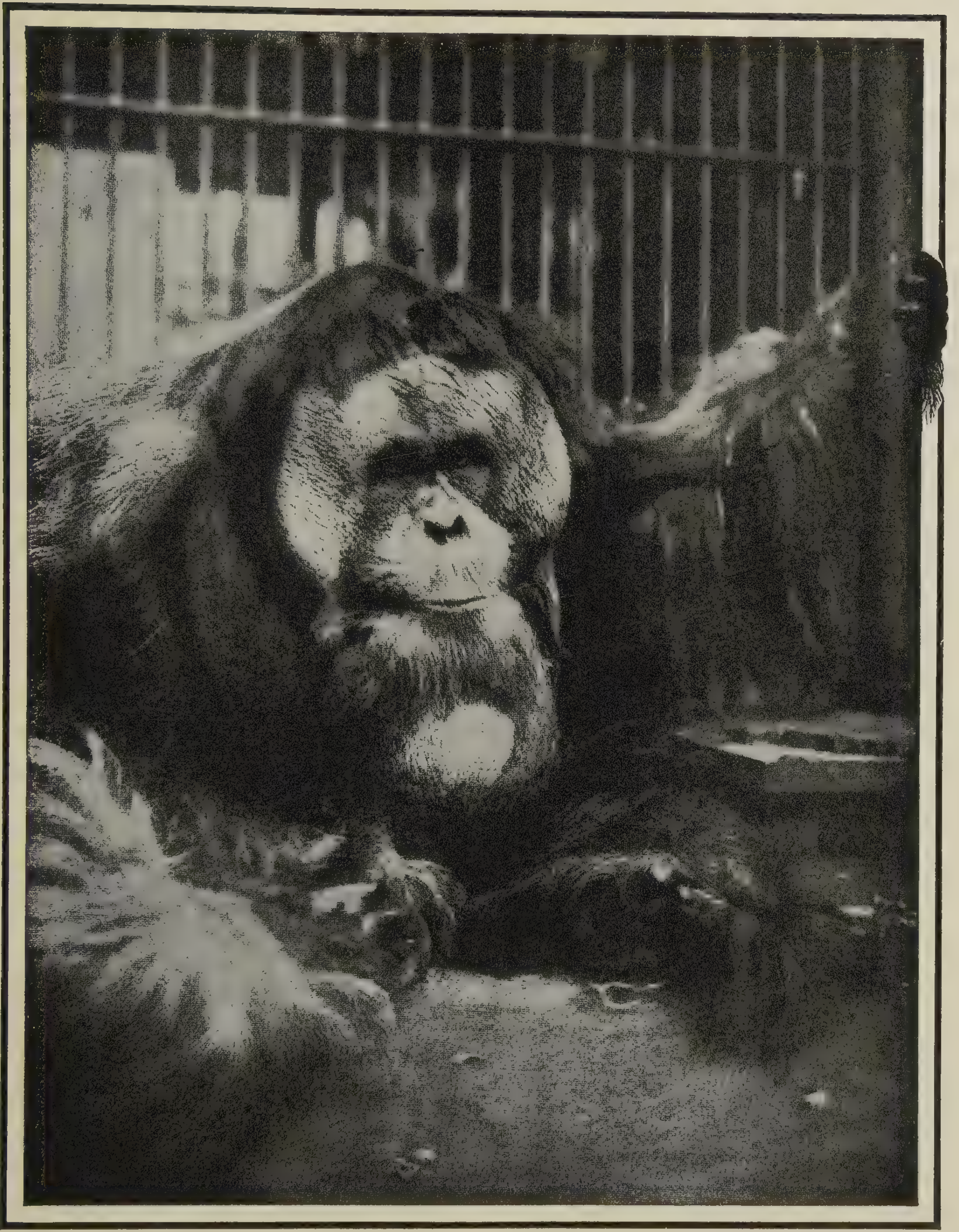
IT is not the work of this volume to treat of animals outside of our English-speaking lands where we are at home, as space will not permit. But in closing this section a word and a picture are needed to bring the animal line to an end. Perhaps that word and picture should have been at the beginning. But up from the lowly half-reptile duckbill to the more than half-human chimpanzee seems to be the natural order, and here with "Polly" we have arrived.

A world of questions have been raised and left unanswered. I cannot answer them here. It is my business to arouse the questions in you and set you to answering them.

Who is Polly, for instance? Is she any relation of yours? Volumes have been written on that question, and will be written. I don't know, but in equatorial Africa where they live the "mated pairs seem to remain together permanently; and more than one missionary has been disconcerted, when he tried to show the Africans the wrongness of having several wives, by their disgusted reply that they did not wish to be like apes. They show great affection for their families, the father often taking the baby from the mother and carrying it, especially in dangerous places; and they seek to assist one another when hurt or in trouble."

That certainly sounds human.

"The West African gorillas," says Ernest Ingersoll, "are the biggest, fiercest, and yet most anthropoid of them all; the most repulsive of all beasts, perhaps, because so like humanity devoid of every attractive quality except mere physical strength. A gorilla is of so massive a frame as to weigh more than twice as much as any man of similar height. In relative shortness of arms and length of legs it stands nearest man, but its brain is no larger than that of a four-year-old child. The face is naked and black, very wide, with a huge protruding mouth, nostrils broad and flat, and the eyes overhung by bony ridges. To a prominent ridge on the skull, running from the forehead back to the nape, are attached thick masses of temporal and neck muscles.



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ORANG-UTAN

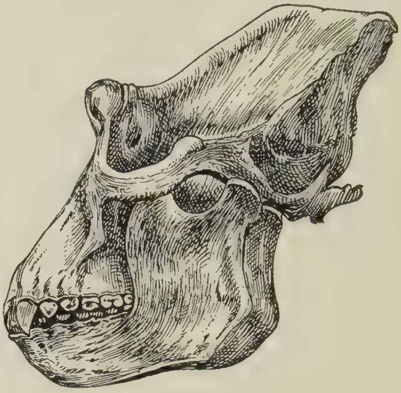
The canine teeth are formidable tushes, and the whole face, crowned by reddish hair and set closely above the shaggy, massive shoulders, expresses brutal savagery."[1]

The gorilla is the least intelligent of the apes. Look at its skull here and see how little brain room it has!

The Barbary ape dwells in Morocco and Algeria, and is also found in a small band living in freedom on the Rock of Gibraltar. It is about two and a half feet long, light brown, with the naked parts pinkish, and it has no tail.

Of the most repulsive of all this species of mammals, the baboon, there are about a dozen kinds, varying from the size of a spaniel to that of a mastiff. The fur may be blackish or greenish or a yellowish-gray. Unlike other monkeys, baboons prefer living in the open country to life in the forest. They frequently travel about in large companies.

Among the others of the family are the well-known orang-utan, the gibbon, and mandril, besides the many monkeys of South America. Representative South American monkeys are the capuchins, which journey about in small, orderly troops in different parts of the continent. So far as possible they live and travel in the branches of trees, the higher the more to their taste. It is these monkeys that supply our organ grinders with their animal assistants.



SKULL OF GORILLA

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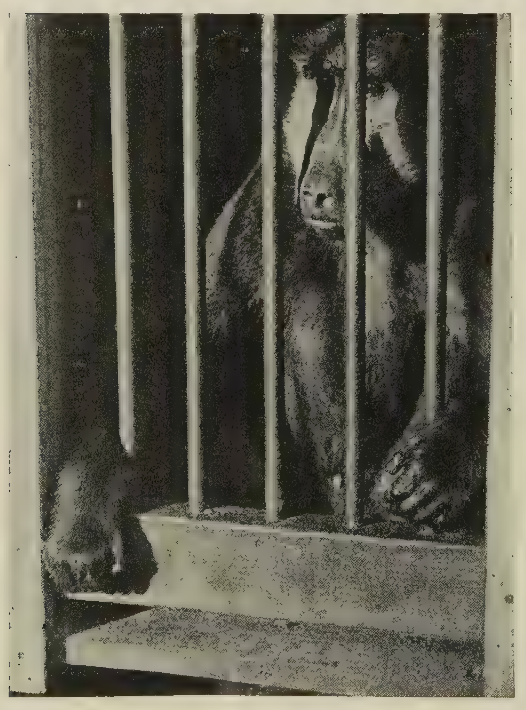
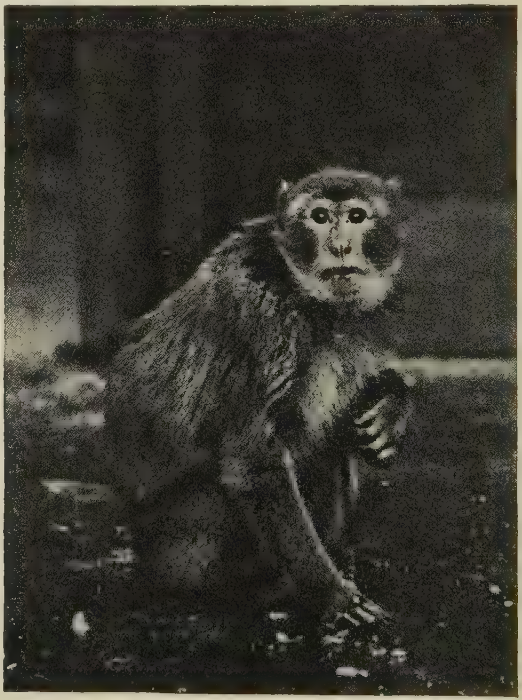
[1] "Life of Animals."



BABOON



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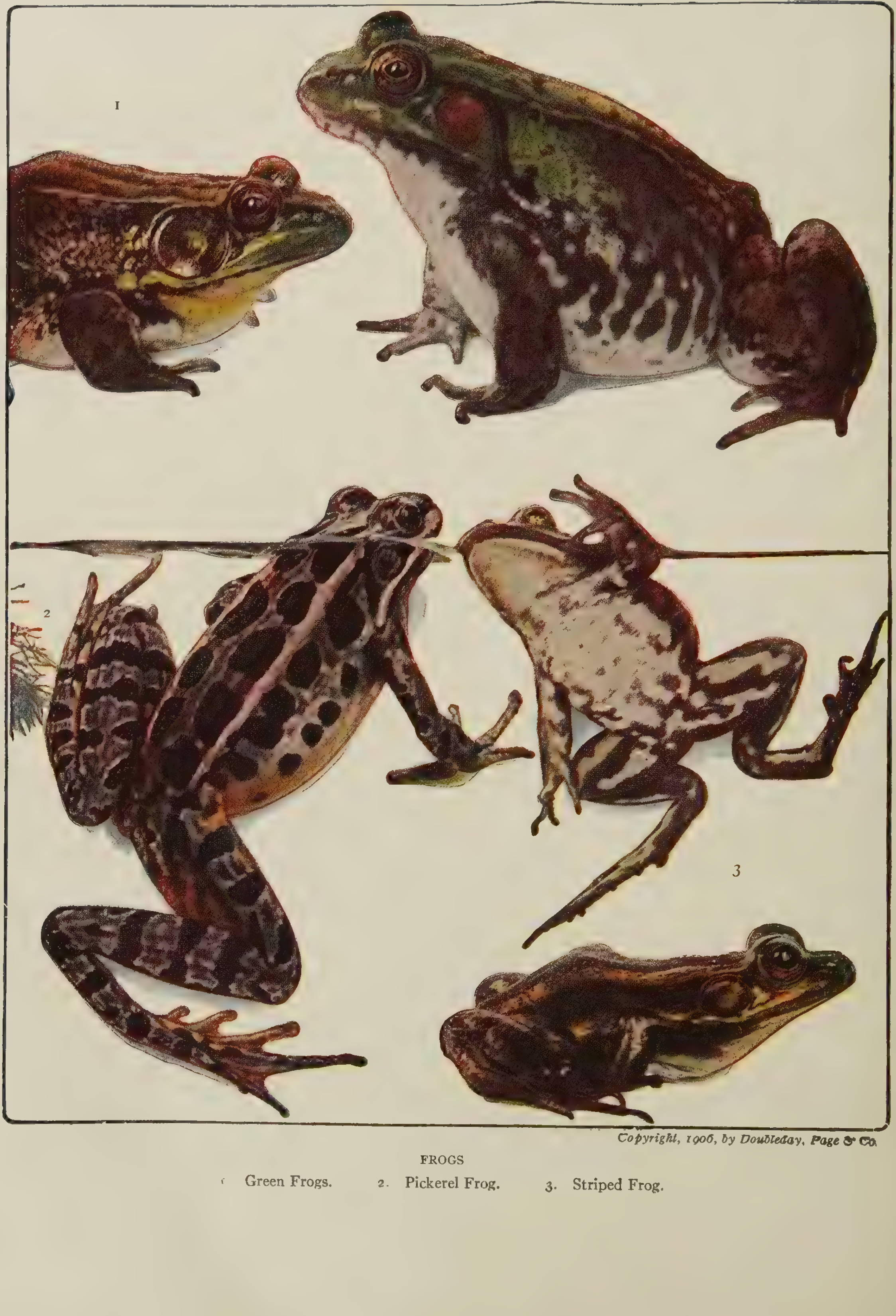
BARBARY APE



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FROGS

1. Green Frogs. 2. Pickerel Frog. 3. Striped Frog.

FISHES, FROGS, AND REPTILES

NEWTS AND SALAMANDERS

THESE burrowing and aquatic forms, while extremely interesting for zoölogical reasons, do not play a large part in our outdoor study. They are not plentiful or conspicuous, very seldom taking any part in the drama going on about us, so far as we can see. Yet one of the finest bits of description in Mr. Burroughs's books is about the little red salamander so frequently raked up under the leaves in the woods. Mr. Burroughs says it makes more music in the autumn woods than any bird.

I must give you the passage, for again it shows that after all it is the mind and imagination behind the eye — behind the ear in this case — that is all important in the naturalist's equipment.

"WATCH AND WAIT" IS THE NATURALIST'S SIGN

"There is always a new page to be turned in natural history, if one is sufficiently on the alert. 'Watch and Wait' is the naturalist's sign. For years I have been trying to ascertain for a certainty the author of that fine plaintive piping to be heard more or less frequently, according to weather, in our summer and autumn woods. It is a note that much resembles our small marsh frog's in spring — the hyla; it is not quite so clear and assured, but otherwise much the same. Of a very warm October day I have heard the wood vocal with it; it seemed to proceed from every stump and tree about me. Ordinarily it is heard only at intervals throughout the woods. Approach ever so cautiously the spot from which the sound proceeds, and it instantly ceases, and you may watch an hour without again hearing it. Is it a frog, I said, the small tree frog, the piper of the marshes, repeating his spring note, but little changed, amid the trees? Doubtless it is, yet I must see him in the very act. So I watched and waited, but to no purpose, till one day, while bee hunting in the woods, I heard the sound proceed from beneath the leaves at my feet. Keeping entirely quiet, the little musician presently emerged, and, lifting himself up on a small stick, his throat palpitated and the plaintive note again came forth. 'The queerest frog ever I saw,' said a youth who accompanied me, and whom I had enlisted to help solve the mystery. No; it was no frog or toad at all, but the small red salamander, commonly called lizard. The color is not strictly red, but a dull-orange, variegated with minute specks or spots. This was the mysterious piper, then, heard from May to November through all our woods, sometimes on trees, but usually on or near the ground. It makes more music in the woods in autumn than any bird. It is a pretty, inoffensive creature, walks as awkwardly as a baby, and may often be found beneath stones and old logs in the woods, where, buried in the mold, it passes the winter."

This little salamander is the Red Triton (*Spelerpes ruber*).

SALAMANDERS DISTINGUISHED FROM FROGS

"The living North American batrachians (all of the frogs, toads, and salamanders) differ enough to allow classification into two distinct orders, the *Urodela* and the *Salientia*. The Urodela are the *tailed* batrachians, or salamanders, with various popular names, such as mud puppies, or water dogs, tritons, newts, and efts. The Salientia are the *tailless* batrachians, *i. e.*, the toads, tree frogs, frogs, and all batrachians that have the froglike form.

"There can never be any confusion in identifying a batrachian as a member of one or the other of these two orders. The Urodela is always tailed, has an elongated body, and legs of nearly equal size; while any member of the Salientia has a relatively short, stout body without a tail and with the long hind legs developed for jumping and swimming.

"The members of the order Urodela vary considerably in their habits and life histories. Like all the batrachians, they usually pass through a larval aquatic existence, after which they may remain aquatic or may become terrestrial in habit. The aquatic forms usually have the tail flattened vertically to aid in swimming; while the terrestrial forms have a rounded tail. A few, like Necturus, keep the gills throughout their lives.

"The Urodela represent in numbers about one tenth of the batrachian group as known in the world at present; that is, about one hundred species. Of this number between sixty and seventy are American species."[1]

RED-BACKED SALAMANDER

Of these sixty and more species the commonest is the little red-backed salamander, to be found everywhere under stones and decaying logs. And a strange thing about the little creature is that when its eggs are laid under the old logs (*not* in the water), the parent watches over them! So, at least, it is said. I wish you would watch and report.

THE SPOTTED SALAMANDER

Often in digging in my garden I turn up big, clumsy, slow-going spotted salamanders. Their eggs are laid in the water and go through the tadpole changes, except that they never absorb their tails.

THE AXOLOTLS

Among the many peculiar forms of newts and salamanders are the Mexican axolotls, which are unusual in that they never (in Mexico) pass from the tadpole stage — are always young.

However, in the Mexican lakes the axolotls remain permanently in the water, retaining their gills throughout life, and laying eggs as if they were adult; and it was consequently long considered that they belonged to a type with persistent gills. They look like the picture at the foot of page 239.

TADPOLE STAGE OF MEXICAN AXOLOTLS

"It was not, indeed, until the year 1865 that light was thrown on the history of these remarkable creatures by six examples which had been living for more than a year at Paris. These comprised five males and one female, and in the middle of February the latter began to lay eggs, which in the course of a month hatched into tadpoles like their parents. In the following September the gills and crest of the tail of one of these began to shrivel, while the head increased in size and yellow spots made their appearance upon the dark skin. Toward the end of the same month, and in the early part of October, similar changes took place in the others, and soon afterward all of them assumed the appearance of a salamander which had been previously described as *Amblystoma tigrinum*. Subsequently experiments were made with other young axolotls by placing them in a glass vessel filled with water, but with rocks at one end, so that the creatures could creep out and expose themselves to the air as much as they pleased. After the interval of a day the amount of water in the vessel was diminished. Almost immediately the gills of the axolotls began to shrink, and, in the course of time, during which they dwelt chiefly in damp moss, the creatures gradually developed into air-breathing salamanders.

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[1] From "The Frog Book," by Mary C. Dickerson. By permission of Doubleday, Page & Co.

"It has been inferred from these remarkable experiments that the Mexican axolotl, like the other members of the genus to which it belongs, originally went through the normal series of transformations; but that, owing to the dry nature of the country it inhabits, it has acquired the habit of retaining the larval condition permanently. From its being able to breed in this state, it may further be inferred that the tadpole stage was originally the permanent condition of all members of the order, and that the salamander stage is a later development."[1]

SIRENS, HELLBENDERS, AND MUD PUPPIES

The Menobranchus of our Western lakes and rivers is closely allied. This animal, unlike the proteus, is highly colored, sees clearly, and has its feet comparatively well developed.

The siren, or mud eel of the more Southern states, lacks the hind pair of limbs. It is of a deep-blue color, and reaches a length of two feet. Its range is very extensive in the valley of the Mississippi.

Then there is the proteus, that curious half-transparent newt, with a round body and tiny, helpless legs, which lives in eternal darkness in the still underground pools of the Carniola caverns near Adelsberg, Germany. He has become well fitted for his dismal life, for his tiny eyes are grown over with skin, and he never loses the feathery gills on each side of his neck, but lives like a tadpole all his life, although he has true lungs.

In this respect he is like our mud puppy (*Necturus maculatus*), found in the Great Lakes and waters near by, for he also has gills and lungs in the adult state. The largest of our North American salamanders is the hellbender of the rivers of Ohio and of the Susquehanna valley.

THE NEWT

The best-known member of this whole group is perhaps the newt, to be found the world over wherever water flows. I have seen them by the scores in the little pools under a rocky waterfall in North Carolina, caught them on the Pacific coast, and read of them in the writings of European naturalists. So have you. They are readily caught with a scoop net, and in the aquarium can be easily studied and made to show the habits of the whole great family.

Our little newt is *Diemyctylus viridescens*. With his olive-green back, his rows of black-bordered vermilion spots down the sides, and his yellowish, black-dotted under parts he makes a lively and brilliant bit of color for the aquarium. Newts are great mosquito eaters.

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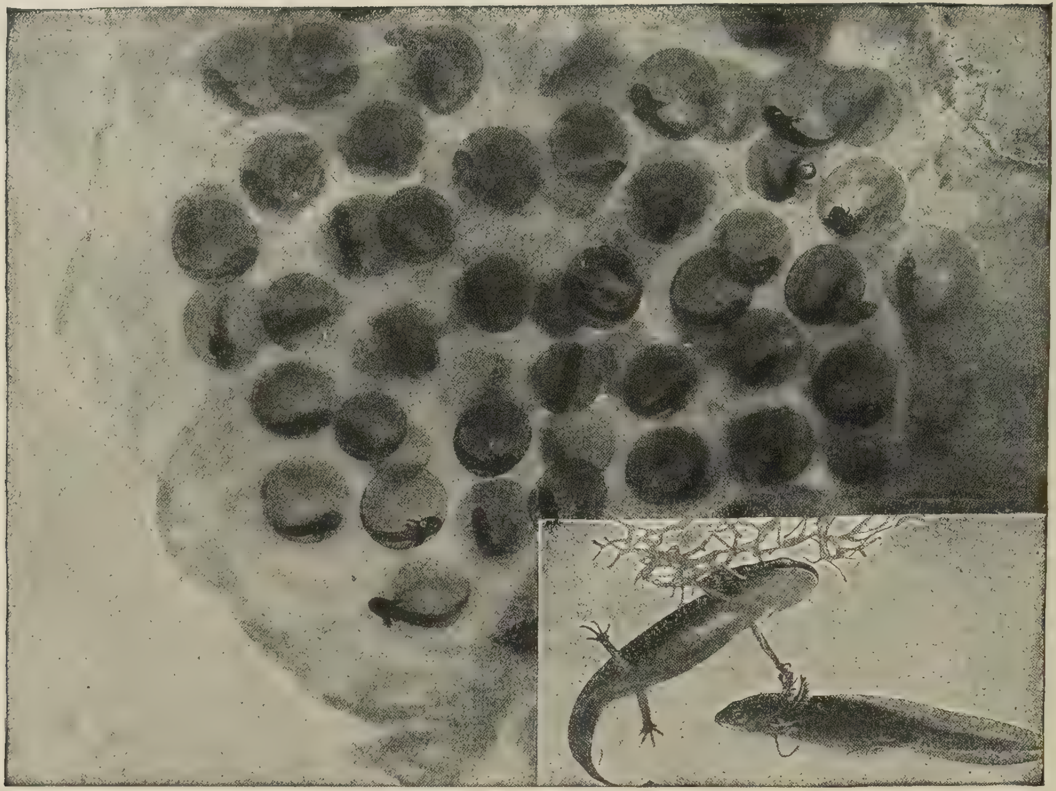
[1] "The New Natural History."

MEXICAN AXOLOTL

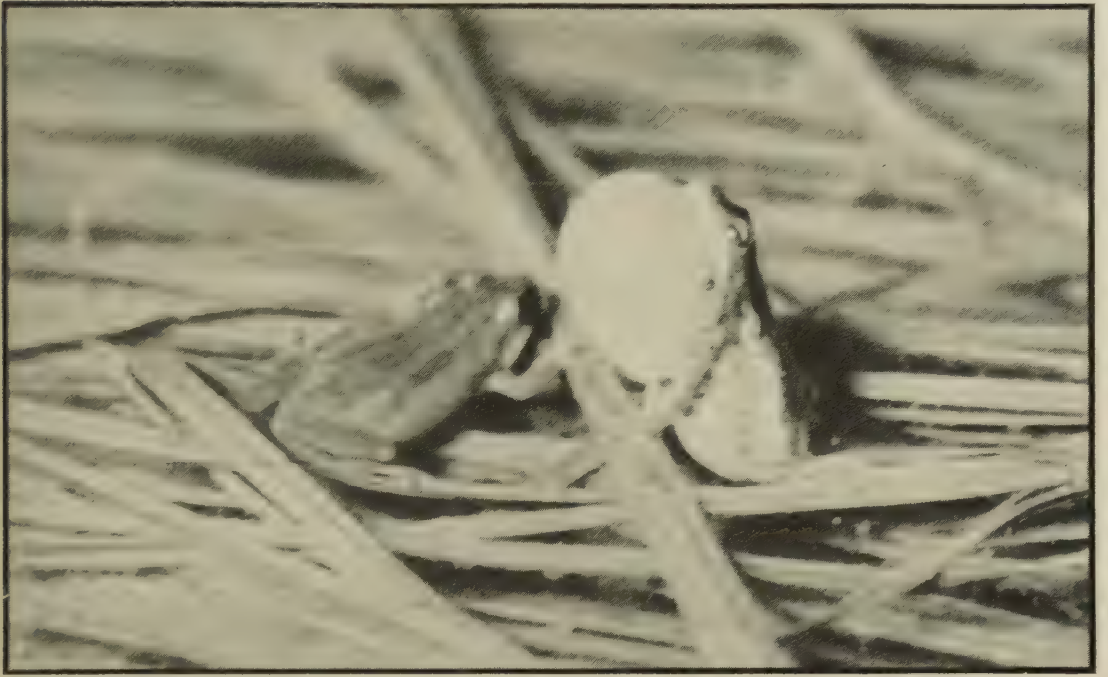


SPOTTED SALAMANDER (*Amblystoma punctatum*) [ENLARGED]

The spherical eggs inclosing the embryos are within an external mass of jelly. The full-grown larva has a tail fin and external gills adapting it to water life.

SPOTTED SALAMANDERS ONE YEAR OLD

Black, with yellow spots. Typical representatives of the Urodela, which together with the Salientia, or froglike forms, constitute the two classes of the North American batrachia. One half natural size.



Courtesy of Field Museum of Natural History, Chicago

SWAMP TREE FROGS

The male frog is singing; his balloon-like vocal pouch which acts as a resonator is distended with air.

TOADS AND FROGS

THE SPRING PEEPERS

I WISH this chapter could come at the beginning of this big book, because there are to be spring peepers in it, and spring peepers always suggest to me the beginning of things. The world and life and everything seem to me to start all new with the sound of the first spring peepers. The silvery tinkling of the peepers starts the sap to running in my winter-stilled veins and tingles every nerve in my body into joyous excitement. *Pe-ep, pe-ep, pe-ep, pe-ep, pe-pe-pe-ep-ep-ep* — like wine it tastes, like some tiny glass of elixir renewing life.

"There are many lovers of the out-of-doors who court her in her robes of roses and in her blithe and happy hours of bird song only. Now a lover that never sees her barefoot in the meadow, that never hears her commonplace chatter at the frog pond, that never finds her in her lowly, humdrum life among the toads and snakes, has little genuine love for his mistress.[1]

"To know the pixy when one sees it, to call the long Latin name of the ragweed, to exclaim over the bobolink's song, to go into ecstasies at a glorious sunset, is not, necessarily, to love Nature at all. One who does all this sincerely, but who stuffs his ears to the din of the spring frogs, is in love with Nature's pretty clothes, her dainty airs, and fine ways. Her warm, true heart lies deeper down. When one has gone down to that, then a March without peepers will be as lonesome as a crowd without friends; then an orchard without the weather-wise hyla can never make good his place with mere apples; and the front door without a solemn, philosophic toad beneath its step will lack something quite as needful to its evening peace and homeness as it lacks when the old-fashioned roses and the honeysuckle are gone.

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[1] This and the following paragraphs are quoted from my "Wild Life near Home."

"We hear a great deal of soft, sentimental talk about the beauties of Nature; but unless we can see the beauty in the toad — the common old hop-toad, we do not get very deep down with our love. These humble little folk, do we more than barely endure them? No one can help feeling the comfort and sympathy of the bluebird. The very drifts soften as he appears. He comes some March morning in a flurry of snow, or drops down out of a cheerless, soaking sky, and assures us that he has just left the South and has hurried ahead at considerable hazard to tell us that spring is on the way. Yet, here is another voice, earlier than the bluebird's often, with the bluebird's message and with even more than the bluebird's authority; but who will listen to a frog? A prophet is not without honor save in his own country. One must needs have wings and come from a foreign land to be received among us as a prophet of the spring.

"Suppose a little frog noses his way up through the stiff, cold mud, bumps against the ice, and pipes, *Spring, spring, spring!* Has he not as much claim upon our faith as a bird that drops down from no one knows where, with the same message? The bluebird comes because he has seen the spring; Hyla comes because he has the spring in his heart. He that receives Hyla in the name of a prophet shall receive a prophet's reward.

"For me there is no clearer call in all the year than that of the hylas in the break-up days of March. The sap begins to start in my roots at the first peep. There is something in their brave little summons, as there is in the silvery light on the pussy willows, that takes hold on my hope and courage, and makes the March mud good to tramp through. And this despite the fact that these early hylas so aggravated my first attack of homesickness that I thought it was to be fatal. The second night I ever spent away from home and my mother was passed with old Mrs. Tribbet, who had a large orchard, behind which was a frog pond. In vain did she stay me with raisins and comfort me with apples. I was sick for home. And those frogs! When the guineas got quiet, how dreadful they made the long May twilight with their shrieking, strangling, homesick cries! After all these years I cannot listen to them in the evenings of early spring without catching an echo from the back of that orchard, without just a throb of that pain so near to breaking my heart.

"Close by, in a corner lot between the two crossroads of the village, lies a wretched little puddle, the home of countless hylas until the June suns dry it up. Among the hundred or more people who live in the vicinity and who pass the pond almost daily, I think that I am the only one who, until recently, was sure he had ever seen a peeper, and knew that they were neither tadpoles, salamanders, nor turtles. As I was standing by the puddle, one May day, a good neighbor came along and stopped with me. The chorus was in full blast — cricket frogs, Pickering's frogs, spring frogs, little swamp tree frogs, and, leading them all, the melancholy quaver of Bufo, the 'hop-toad.'

"'What is it that makes the *dreadful* noise?' my neighbor asked, meaning, I knew, by 'dreadful noise' the song of the toad. I handed her my opera glass, pointed out the minstrel with the doleful bagpipe sprawling at the surface of the water, and, after sixty years of wondering, she saw with immense satisfaction that one part in this familiar spring medley was taken by the common toad.

SIXTY SPRINGS OF LOOKING

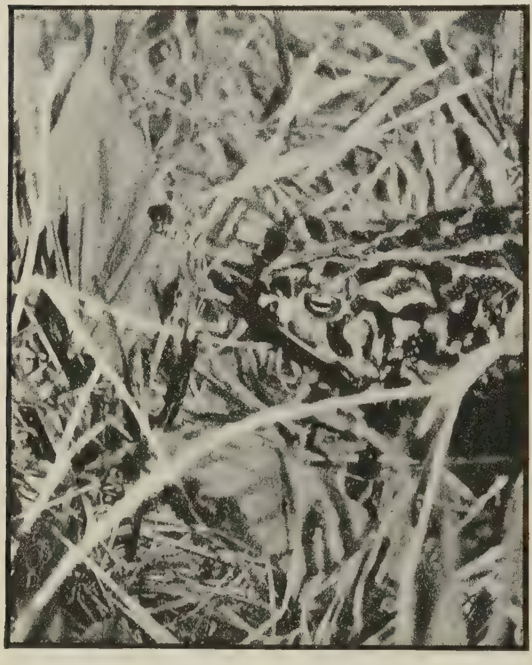
"Sixty springs are a good many springs to be finding out the author of so well known a sound as this woeful strain of the serenading toad; but more than half a century might be spent in catching a cricket frog at his song. I tried to make my neighbor see one that was clinging to a stick in the middle of the puddle; but her eyes were dim.

THE PROTECTIVE COLORING OF THE FROGS AND TOADS

"Deft hands have dressed these peepers. We have heard them by the meadowful every spring of our life, and yet the fingers of one hand number more than the peepers we have seen. One day I bent over three lily pads till nearly blind, trying to make out a cricket frog that was piping all the while somewhere near or upon them. At last, in despair, I made a dash at

A PLEASANT PLACE TO SIT AND WATCH FOR TOADS AS THEY COME OUT FOR THEIR NIGHT'S HUNTING the pads, only to see the wake as the peeper sank to the bottom an instant before my net struck the surface.

"The entire frog family is as protectively colored as this least member, the cricket frog. They all carry fern seed in their pockets and go invisible. Notice the wood frog with his tan suit and black cheeks. He is a mere sound as he hops about over the brown leaves. I have had him jump out of the way of my feet and vanish while I stared hard at him. He lands with legs extended, purposely simulating the shape of the ragged, broken leaves, and offers, as the only clew for one's baffled eyes, the moist glisten as his body dissolves against the dead brown of the leaf carpet. The tree toad, *Hyla versicolor*, still more strikingly blends with his surroundings, for, to a certain extent, he can change color to match the bark upon which he sits. More than once, in climbing apple trees, I have put my hand upon a tree toad, not distinguishing it from the patches of gray-green lichen upon the limbs. But there is less of wonder in the tree toad's ability to change his colors than in the way he has of changing his clothes. He is never troubled with the getting of a new suit; his labor comes in caring for his old ones. It is curious how he disposes of his cast-off clothes.



FOWLER'S TOAD. A GOOD ILLUSTRATION OF PROTECTIVE COLORATION

GETTING A NEW SUIT

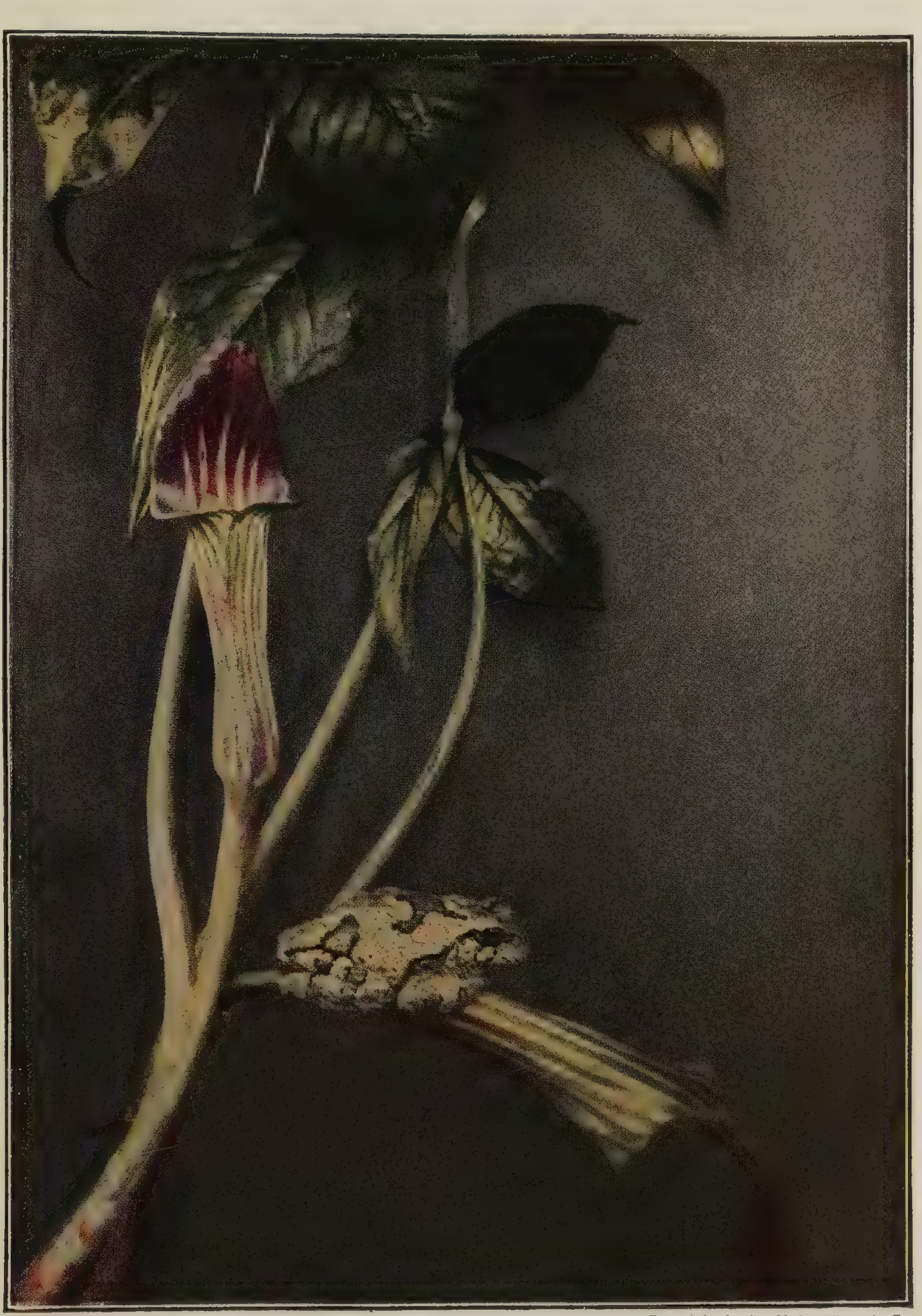
"One day late in autumn I picked up a tree toad that was stiff and nearly dead with cold. I put him in a wide-mouthed bottle to thaw, and found by evening that he was quite alive, sitting with his toes turned in, looking much surprised at his new quarters. He made himself at home, however, and settled down comfortably, ready for what might happen next.

"The following day he climbed up the side of the bottle and slept several hours, his tiny disked toes holding him as easily and restfully as if he were stretched upon a feather bed. I turned him upside down; but he knew nothing of it until later when he awoke; then he deliberately turned round with his head up and went to sleep again. At night he was wide awake, winking and blinking at the lamp, and watching me through his window of green glass.

"A few nights after his rescue, Hyla sat upon the bottom of his bottle in a very queer attitude. His eyes were drawn in, his head was bent down, his feet rolled up — his whole body huddled into a ball less than half its normal size. After a time he began to kick and gasp as if in pain, rolling and unrolling himself desperately. I thought he was dying. He would double up into a bunch, then kick out suddenly and stand up on his hind legs with his mouth wide open as if trying to swallow something. He *was* trying to swallow something, and the thing had stuck on the way. It was a kind of cord, and ran out of each corner of his mouth, passing over his front legs, thinning and disappearing most strangely along his sides.

"With the next gulp I saw the cord slip down a little, and, as it did so, the skin along his sides rolled up. It was his old suit! He was taking it off for a new one; and, instead of giving it to the poor, he was trying to economize by eating it. What a meal! What a way to undress! What curious economy!

"Long ago the naturalists told us that the toads ate their skins — after shedding them;



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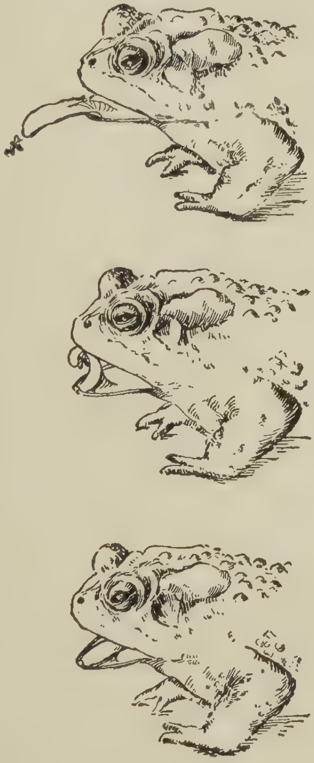
TREE TOAD ON A JACK-IN-THE-PULPIT

but it was never made plain to me that they ate them *while* changing them — indeed, *swallowed* them off! Three great gulps more and the suit — shirt, shoes, stockings, and all — disappeared. Then Hyla winked, drew his clean sleeve across his mouth, and settled back with the very air of one who has magnificently sent away the waiter with the change.



THE MOVEMENT OF THE TOAD'S TONGUE IN CATCHING AN INSECT

The tongue is fastened in front instead of at the back and can be extended fully two inches, in an exceedingly rapid movement. Its surface is sticky.

THE TOAD'S TONGUE

"Four days later Hyla ate up this new suit. I saw the entire operation this time. It was almost a case of surgery. He pulled the skin over his head and neck with his fore feet as if it were a shirt, then crammed it into his mouth; kicked it over his back next; worked out his feet and legs; then ate it off as before. The act was accomplished with difficulty, and would have been quite impossible had not Hyla found the most extraordinary of tongues in his head. Next to the ability to speak Russian with the tongue comes the power to skin one's self with it. The tree toad cannot quite croak Russian, but he can skin himself with his tongue. Unlike ours, his tongue is hung at the front end, with the free end forked and pointing toward his stomach. When my little captive had crammed his mouth full of skin, he stuck this fork of a tongue into it and forced it down his throat and held it down while he kicked and squirmed out of it.

THE HOP-TOAD

"Though less beautifully clothed than Hyla, our common toad, Bufo, is just as carefully clothed. Where the rain drips from the eaves, clean, narrow lines of pebbles have been washed out of the lawn. On one side of the house the shade lies all day long and the grass is cool and damp. Here, in the shade, a large toad has lived for two summers. I rarely pass that way without seeing him, well hidden in the grass. For several days lately he had been missing, when, searching more closely one morning, I found him sunk to the level of his back in the line of pebbles, his spots and the glands upon his neck so mingling with the varied collection of gravel about him that only a practiced eye, and that sharp with expectation, could have made him out.

"In a newly plowed field, with some of the fresh soil sticking to him, what thing could look more like a clod than this brown, shapeless lump of a toad? But there is a beauty even in this unlovely form; for here is perfect adaptability."

But it is in feeding that the toad's tongue does its finest and greatest work, "because," as the author of "The Frog Book"[1] says, "the toad is always hungry. His gastronomic ability is so great that he must have four meals per day, or rather his stomach must be filled and emptied four times in each twenty-four hours. He must therefore hunt and eat almost incessantly in order to get as much as he needs.

"The tongue of the toad, with which he catches his food, is admirably adapted to its work. It has a sticky surface, from which escape of the prey is impossible, and it is fastened at the front instead of at the back. The latter fact makes it possible for the toad to throw the tongue well out of the mouth.

"The toad eats almost all kinds of small living things that are out in the late afternoon and at night. He may sit for an hour or more on the back step and catch the flies and mosquitoes that come to the screen door in their attempt to get into the house. He sits with head bent forward and eyes looking very bright and intelligent. When he sees a fly alight within two inches of his nose, he makes no perceptible movement of the head or body.

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[1] Mary C. Dickerson.

"The mouth opens and the fly is gone. When the fly alights farther away, the toad springs forward on his strong hind legs, then easily slips back into a sitting posture again. That is all that we can see, but again the fly is gone."

Our canons of the beautiful are false if they do not in some way include the toad. Shall we measure all the out-of-doors by the linnet's song, the cardinal flower's flame, and the hayfield's odor? By no means. We must love with our *minds* as well as with our hearts; we must *know* beauty as well as see it, and no one can *know* a toad — his life history, his wonderful adaptation to his surroundings, his great usefulness — without feeling that he is just as good material for a poem as the dandelion that Lowell wrote about. Indeed, poems have been written about him. Don't you know these lines from Shakespeare?

> "The ungainly toad
> That crawls from his secure abode,
> Within the mossy garden wall,
> When evening dews begin to fall.
> Oh, mark the beauty of his eye,
> What wonders in that circle lie!
> So clear, so bright, our fathers said —
> 'He wears a jewel in his head.'"

And what does the "Ancient Mariner" mean but what I have just said when he cries:

> "Farewell, farewell! but this I tell
> To thee, thou Wedding Guest, —
> He prayeth well, who loveth well
> Both man and bird and beast.
>
> "He prayeth best, who loveth best
> All things both great and small;
> For the dear God who loveth us,
> He made and loveth all."

HOW THE POETS FEEL ABOUT TOADS

If you want to know how real poets feel about "ugly" toads, read "An Island Garden," by Celia Thaxter. You must allow me to quote a short passage from that beautiful book:

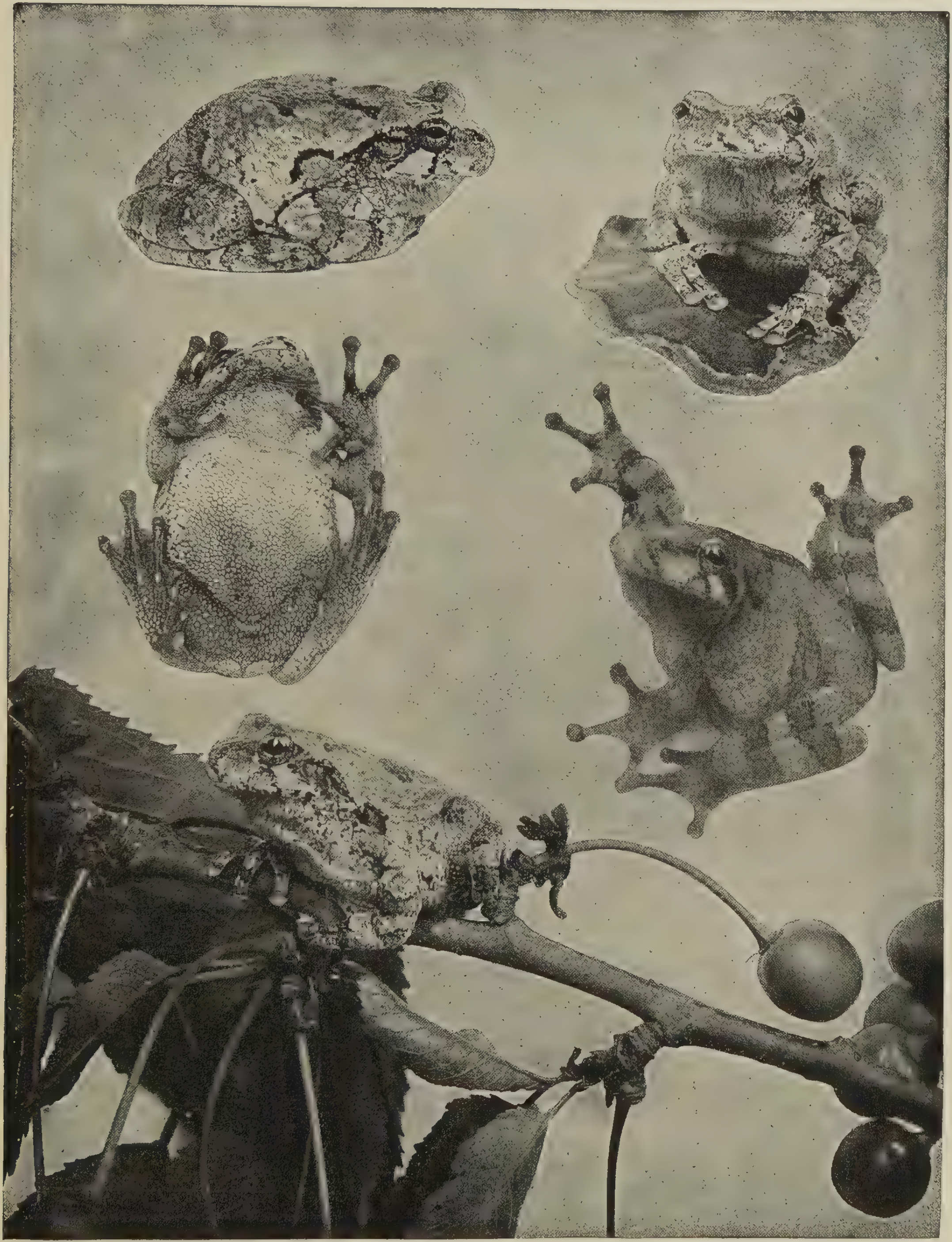
"Before I knew what to do to save my garden from the slugs, I have stood at evening rejoicing over rows of fresh emerald leaves just springing in rich lines along the beds, and waked in the morning to find the whole space stripped of any sign of green, as blank as a board over which a carpenter's plane has passed.

"In the thickest of my fight with the slugs someone said to me, 'Every living thing has its enemy; the enemy of the slug is the toad. Why don't you import toads?'

"I snatched at the hope held out to me, and immediately wrote to a friend on the continent, 'In the name of the Prophet, Toads!' At once a force of only too willing boys was set about the work of catching every toad within reach, and one day in June a boat brought a box to me from the far-off express office. A piece of wire netting was nailed across the top, and upon the earth with which it was half filled, reposing upon some dry and dusty green leaves, sat three dry and dusty toads, wearily gazing at nothing. Is this all, I thought, only three! Hardly worth sending so far. Poor creatures! they looked so arid and wilted, I took up the hose and turned upon them a gentle shower of fresh cool water, flooding the box. I was not prepared for the result! The dry, baked earth heaved tumultuously: up came dusky heads and shoulders and bright eyes by the dozen. A sudden concert of liquid sweet notes was poured out on the air from the whole rejoicing company. It was really beautiful to hear that musical ripple of delight. I surveyed them with eager interest as they sat singing and blinking together. 'You are not handsome,' I said, as I took a hammer and wrenched off the wire cover that shut them in, 'but you will be lovely in my sight if you will help me to destroy mine enemy, and with that I turned the box on its side and out they skipped into a perfect paradise of food and shade. All summer I came upon them in different parts of the garden, waxing fatter and fatter till they were as round as apples. In the autumn baby toads no larger than my thumb nail were found hopping merrily over the whole island. There were sixty in that first importation; next summer I received ninety more."

"SHARP EYES"

Another book with toads in it, that you ought to know, is William Hamilton Gibson's "Sharp



STUDIES OF THE TREE FROG

Upper left: Frog on bottom of bottle. Center left: Frog creeping up side of bottle. Note the disks. Center right: Frog clinging to side of bottle.

By Robert Bruce Horsfall

WHERE THE TREE TOAD PASSES THE WINTER

Eyes." I cannot forbear to give you one glimpse into it:

"But the early musicians are now forgotten. A new singer has come upon the scene, and his mellow nocturne in the twilight marshes brings a message unknown to his predecessors. This is no shrill peep that stirs your blood and sets your ears a-tingle, no bubbling rattle or vibrant croak that cries 'qui vive' to your eager senses, but a drowsy drool that brings your feet to loitering in the deepening dusk, and whose distant music from the swampy lowlands lulls you on your pillow. It is to me the sweetest sound in Nature, the faithful chosen voice of the twilight, one of the most characteristic attributes of late spring, and yet, like the sprightly welcome of the hylodes which ushers in the vernal season, it still remains unsung by our poets, or if occasionally acknowledged the true singer never gets the credit.

"Who will immortalize in verse the pensive witchery, 'most musical, most melancholy,' of this tremorous song of the toad, for it is in truth the uncouth and ill-favored toad that now swells this bagpipe in the marshes and fills the night with music? It is one of the beneficences of Nature that the twilight glamour throws a veil of obscurity over the performer while it emphasizes and consecrates its music."[1]

ON THE TOP OF A FLAG POLE[2]

However, the toad to the most of us is anything but a poem. What, indeed, looks less lovely, less nimble and buoyant, more chained to the earth, than a toad? But stretch the least web between his toes, lengthen his hind legs, and — over he goes, the leopard frog, champion high diver of the marsh! Or, instead of the web, tip his toes with the tiniest disks, and — there he swings, Pickering's little hyla, clinging as easily to the under surface of that oak leaf high in the tree as a fly clings to the kitchen ceiling.

When a boy, I climbed to the top of the flag pole on one of the state geological survey stations. The pole rose far above the surrounding pines — the highest point for miles around. As I clinched the top of the staff, gripping my fingers into the socket for the flag stick, I felt something cold, and, drawing myself up, found a tree toad asleep in the hole. Under him was a second toad, and under the second a third — all dozing up here on the very topmost tip of all the region.

From the river ooze to the tree top, Nature carries this toad form simply by a thin web between the toes, or by tiny disks at their tips. And mixing her greens and browns with just a dash of yellow, she paints them all so skillfully that, upon a lily pad, beside a lump of clay, or against the lichened limb of an old apple tree, each sits as securely as Perseus in the charmed helmet that made him invisible.

ENEMIES OF THE TOADS AND FROGS

The frogs have innumerable enemies among the water birds, the fish, the snakes, and such animals as the fisher, coon, possum, and mink. The toads fortunately are supplied with glands behind their heads whose secretion is hateful to most of their foes, though it seems to be no offense whatever to the snakes. A toad's only chance, when a snake is after him, lies in hiding. I once saw a race between a toad and an adder snake, however, in which the hopper won.

One bright May morning I was listening to the music of the church bells, as it floated out

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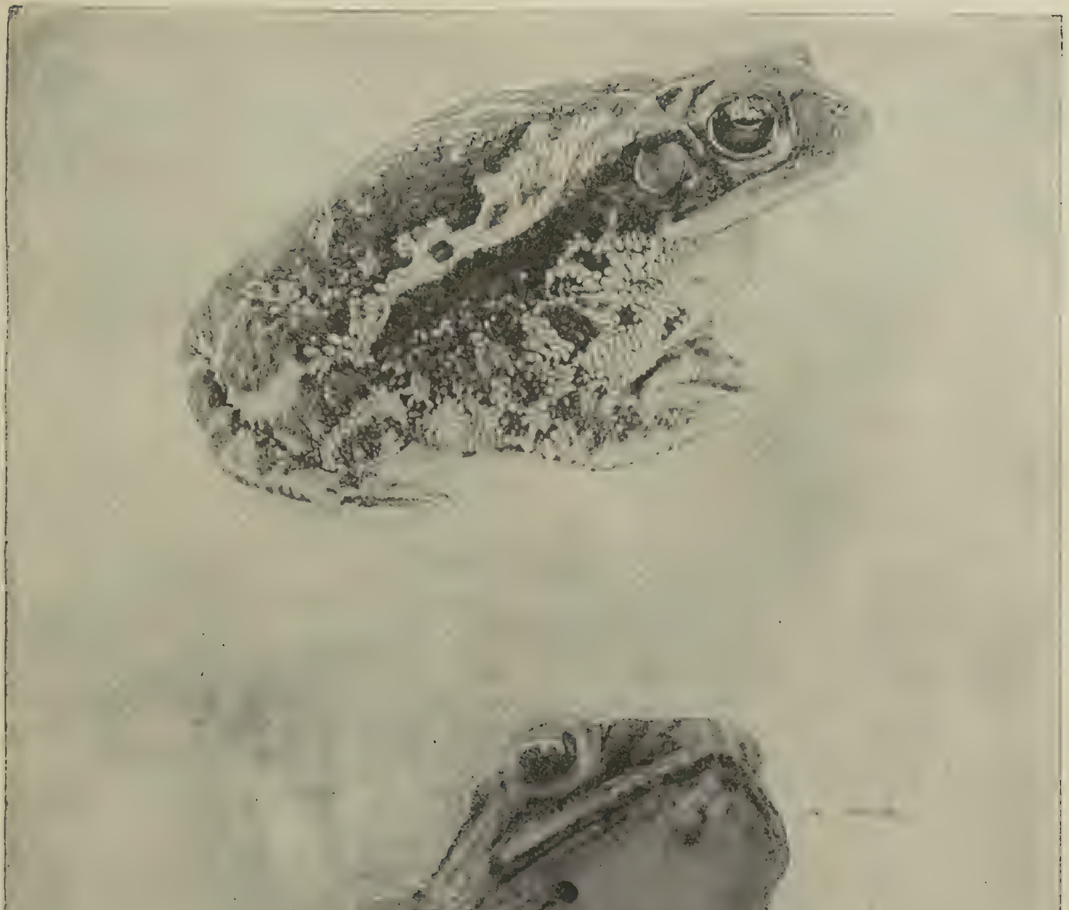
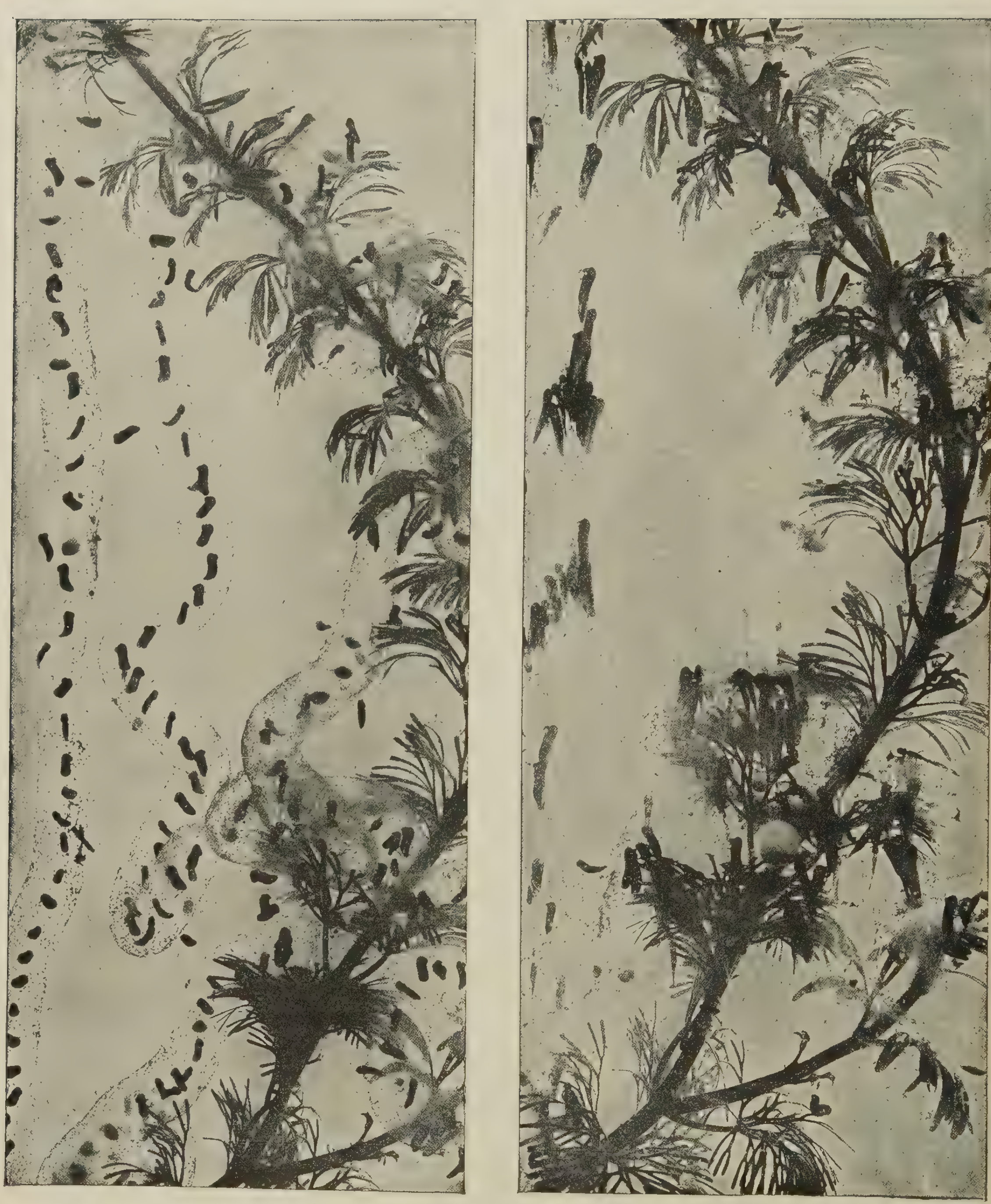
[1] Copyright by Harper & Brothers.

[2] The following sections are from "Wild Life near Home."



ABOVE: *Bufo valliceps.* THIS SPECIES OF TOAD IS ALERT, BUT LESS WILD THAN MOST NORTH AMERICAN FORMS. BELOW: TOAD PHOTOGRAPHED (IN WATER) TO SHOW OUTLINE OF JAW, TEXTURE OF SKIN OF UNDER PARTS, AND STRUCTURE OF HAND



DEVELOPMENT OF TOAD'S EGGS

Toad's eggs laid June 12. Photographed June 13, twenty-four hours later. Eggs inclosed in curling, cylindrical jelly masses.

Toad tadpoles are hatched June 16, four days after the eggs are laid. The jelly mass is almost wholly disintegrated from the city and called softly over the fields, when my reverie was interrupted by a sharp squeak and a thud beside the log on which I sat; something dashed over my foot; and I turned to catch sight of a toad bouncing past the log, making hard for the brush along the fence. He scarcely seemed to touch the ground, but skimmed over the grass as if transformed into a midget jack rabbit. His case was urgent; and little wonder! At the opposite end of the log, raised four or five inches from the grass, her eyes hard glittering, her nose tilted in the air, and astonishment all over her face, swayed the flat, ugly head of a hognose adder. Evidently she, too, had never seen a toad get away in any such time before; and after staring a moment she turned under the log and withdrew from the race, beaten.

Hungry snakes and hot, dusty days are death to the toads. Bufo would almost as soon find himself at the bottom of a well as upon a dusty road in blazing sunshine. His day is the night. He is not particular about the moon. All he asks is that the night be warm, that the dew lay the dust and dampen the grass, and that the insects be out in numbers. At night the snakes are asleep, and so are most of those ugly, creaking beasts with rolling iron feet that come crushing along their paths. There is no foe abroad at night, and life, during these dark, quiet hours, has even for a toad something like a dash of gayety.

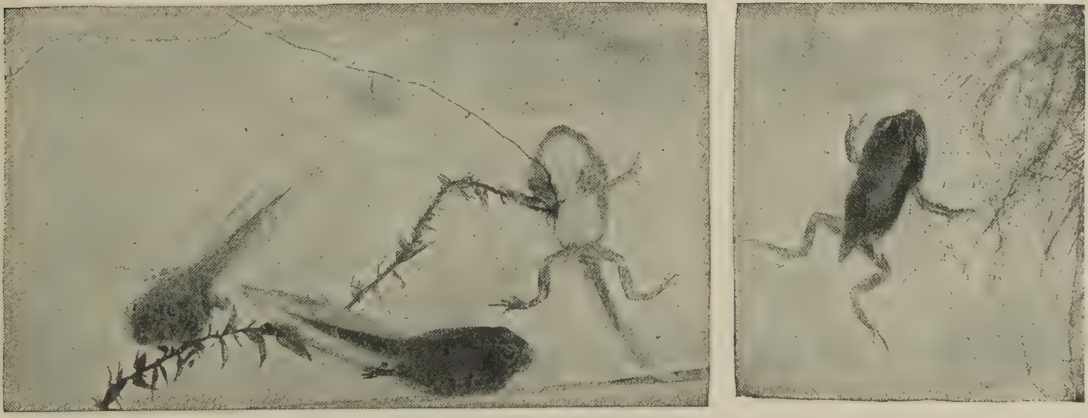
HOW A TOAD DRINKS

In one of the large pastures not far away stands a pump. It is shaded by an ancient apple tree, under which, when the days are hottest, the cattle gather to doze and dream. They have worn away the grass about the mossy trough, and the water, slopping over, keeps the spot cool and muddy the summer through. Here the toads congregate from every quarter of the great field. I stretched myself out flat on the grass one night and watched them in the moonlight. There must have been fifty here that night, hopping about over the wet place — as grotesque a band as ever met by woods or waters.

We need no "second sight," no pipe of Pan, no hills of Latmos with a flock to feed, to find ourselves back in that enchanted world of the kelpies and satyrs. All we need to do is to use the eyes and ears we have, and haunt our hills by morning and by moonlight. Here in the moonlight around the old pump I saw goblins, if ever goblins were seen in the light of our moon.

There was not a croak, not a squeak, not the slightest sound, save the small *pit-pat, pit-pat,* made by their hopping. There may have been some kind of toad talk among them, but listen never so closely, I could not catch a syllable of it.

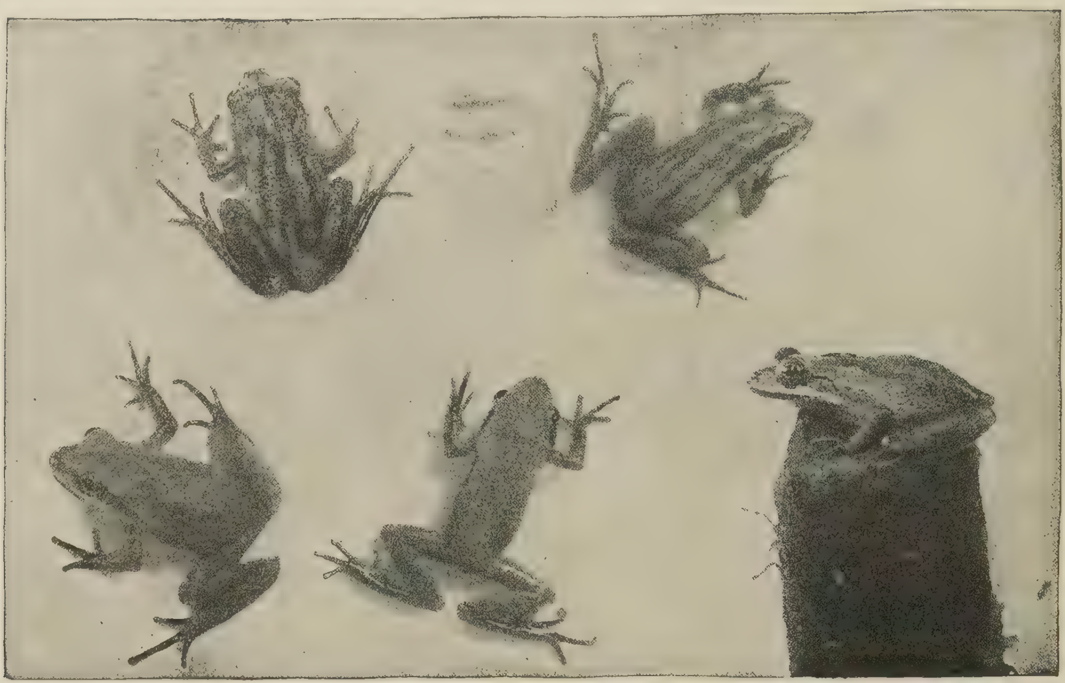
Where did they all come from? How did they find their way to this wet spot over the



LATER STAGES OF DEVELOPMENT

The hind legs appear. They project straight backward. The joints are perfected and the foot projects outward. The legs and the tail are used in swimming. Visible changes are occurring in the region of the mouth and eyes. The arms appear.

The tail becomes mysteriously shorter. The little toad constantly rushes to the surface of the water for air.



THE SWAMP TREE FROG (*Chorophilus n. feriarum baird*)

Color gray or brown with or without longitudinal stripes or series of spots. The swamp tree frog does little climbing because of the small size of the disks on fingers and toes; also it is a poor swimmer because of the lack of large webs. He is still another of the prophets, beginning in New Jersey before the Pickering's hyla. His is a low-pitched, soothing sound, and the notes not very rapid. It can easily be told from the silvery jingle of Pickering's and the rattling call of the cricket.

hills and across the acres of this wide pasture? You could walk over the field in the daytime and have difficulty in finding a single toad; but here at night, as I lay watching, every few minutes one would hop past me in the grass; or coming down the narrow cow paths in the faint light I could see a wee black bunch bobbing leisurely along with a hop and a stop, moving slowly toward the pump to join the band of his silent friends under the trough.

Not because there was more food at the pump, nor for the joy of gossip, did the toads meet here. The one thing necessary to their existence is water, and doubtless many of these toads had crossed this pasture of fifteen acres simply to get a drink. I have known a toad to live a year without food, and another to die in three days for lack of water. And yet this thirsty little creature never drinks — as we drink. Instead of drinking they soak! Just like a sponge they sprawl out on their big expansive bellies and soak themselves full.

THE NIGHTLY HUNT

"At the close of a hot summer's day we sit on the doorstep of a country house, delighting in the coolness and repose, and watching the lengthening shadows of grape trellis, well curb, and house. A fat toad comes out from under the doorstep, where he has been quietly sleeping all day; another, clean and bright-eyed, comes from under the sidewalk at our feet. They start off with leisurely hops toward the garden to search for caterpillars and other delicious morsels of a toad's menu. We watch their retreating backs until they disappear among rows of beets and lettuce, and we wish them 'good hunting.' Night after night, summer after summer, toads come out in search of food. They become a part of the place. They help to make the home and contribute their share in its work."

This description is from "The Frog Book," and well it touches the homely evening scene about the farmhouse doorstep — just as it used to be at home.

At the first peep of dawn they are back to "the steps," bulging plump at the sides with worms, grubs, May beetles, sow bugs, and grasshoppers — almost any "bug thing" that may have come along. Why, those dear old toads are worth their weight in diamonds!

TOADS, EGGS, AND TADPOLES

Toads are amphibians — two-lived — and begin their first life in the water, with tails and gills and no feet at all. The eggs are laid in the spring during the period of peeping and croaking in the meadows and ponds. The toad's eggs are laid in strings — thousands of little black dots in ropes of jelly, each dot an egg. The frog's eggs are laid in lumpy jelly masses.

In four days the eggs hatch, the young tadpoles cling with their sucking mouths to the grass stems, and from then on the wonderful changes from tails and gills to legs, from water to land, are all accomplished by the middle of June, as is seen in the picture "From Egg to Frog."

DID YOU EVER SEE A TOAD GO TO BED?[1]

When my toad gets in after a night's hunting, he comes to the cool cucumber vines and proceeds at once to kick himself into bed. He backs and kicks and elbows into the loose sand as far as he can, then screws and twists till he is worked out of sight beneath the soil, hind end foremost. Here he lies, with only his big popeyes sticking out, half asleep, half awake. If a hungry adder crawls along, he simply pulls in his eyes, the loose sand falls over them, and the snake passes on.

WHERE TOADS SLEEP IN WINTER

When the nights begin to grow chilly and there are threatenings of frost, the toads hunt up winter quarters and hide deep down in some warm burrow — till to-morrow if the sun comes out hot, or, it may be, not to wake until next April. Sometimes an unexpected frost catches them, when any shelter must do and even their snake fear is put aside or forgotten. "Misery acquaints a man with strange bedfellows," said Trinculo, as he crawled in with Caliban from the storm. So might the toad say in an early frost.

Toads and frogs are cold-blooded, that is, their temperature changes with the changes in the temperature of the air about them — hotter as the heat of the day and season increases, and colder as the air grows colder. Warm-blooded animals maintain an even temperature in their blood. Thus the warm-blooded animals are not so quickly affected by weather changes, but on the other hand they cannot

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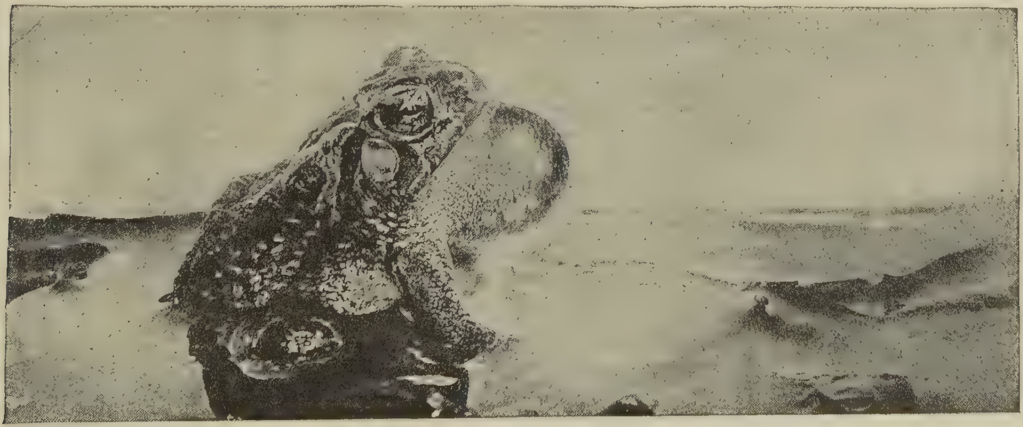
[1] From "Wild Life near Home."



FOWLER'S TOAD SITTING SINGING IN SHALLOW WATER AT POND MARGIN

The rounded vocal pouch is inflated and acts as a resonator. The mouth is kept closed. Hardly to be told from the "common" toad (*Bufo americanus*).

endure the very low temperatures that the cold-blooded animals can, and live. Instead of fighting the cold, the toad yields to it and soon suspends living operations altogether, all heart action ceasing, the blood in the heart even falling below freezing; yet thawing out again, and life coming back with returning warmth.

The workmen in a sandstone quarry near by dug out a bunch of toads one winter, all mixed up with a bunch of adders. They were wriggled and squirmed together in a perfect jumble of legs, heads, and tails — all in their dead winter sleep. Their common enemy, the frost, had taken them unawares and driven them like friends into the crevice of the rocks, where they would have slept together until the spring had not the quarrymen unearthed them.

TOAD TALES

There is much mystery shrouding this humble batrachian. Somewhere in everybody's imagination is a dark cell harboring a toad. Reading down through literature, it is astonishing how often the little monster has hopped into it. There is chance for someone to make a big book of the fable and folklore that has been gathering through the ages about the toads. The stories of the jewels in their heads, of their age-long entombments in the rocks, of the warts and the spells they induce, of their eating fire and dropping from the clouds, are legion.

And there seems to be some basis of fact for all these tales. No one has yet written for us the life history of the toad. After having watched the tadpole miracle, one is thoroughly prepared to see toads jump out of the fire, tumble from broken marble mantels, and fall from the clouds. I never caught them in my hat during a shower; but I have stood on Mauricetown Bridge, when the big drops came pelting down, and seen those drops apparently turn into tiny toads as they struck the planks, until the bridge was alive with them! Perhaps they had been hiding from the heat between the cracks of the planks — but there are people who believe that they came down from the clouds.

How, again, shall I explain this bit of observation? More than six years I lived near a mudhole that dried up in July. I passed it almost daily. One spring there was a strange toad call in the hole, a call that I had never heard anything like before — a deafening, agonizing roar, hoarse and woeful. I found on investigation that the water was moving with spade-foot toads. Two days later the hole was still; every toad was gone. They disappeared; and, though I kept that little puddle under watch for several seasons after that, I have not known a spade-foot to appear there since.

The water was almost jellied with their spawn, and a little later was swarming with spade-foot tadpoles. Then it began to dry up, and some of the tadpoles were left stranded in the deep footprints of the cows along the edge of the hole. Just as fast as the water disappeared in these footprints, the tails of the tadpoles were absorbed and legs formed, and they hopped away — some of them a week before their brothers, that were hatched at the same time, but who had stayed in the middle of the pond, where the deeper water allowed them a longer babyhood for the use of their tails. So swiftly, under pressure, can Nature work with this adaptable body of the toad!

Long before the sun-baked mud began to crack, these young ones had gone — where? And whence came their parents, and whither went they? When will they return?

MR. BULLFROG, "HIS MARK"

THE RAINBOW TROUT (*Salmo irideus*)

Found in small brooks of Coast Range, California.

SOME FOOD AND GAME FISHES

VERY likely a chapter on fishes should be made into a book and put in a place by itself. And so it would, were it not for the fact that in our Nature-study plan the fish, because they are out of sight so much, play no part in the landscape, and because of their under-water habits are difficult of study. After you have hooked your fish, why, you land him — if you can — and fry him, of course!

But that is not all of it. No, no! If you think so, read dear old Izaak Walton on angling, and talk to anyone who goes "a-fishing" because he can't help it.

Among all the *writing* anglers I know there is none I love to read more than James Buckham, with whom you shall later tramp for spring flowers. His publishers have kindly allowed me to give you over to him for a day or two with the fishes. I am going to take from his book, "Where Town and Country Meet," the two following sections, "The Waking of the Fishes" and "Along the Lily Pads."

THE WAKING OF THE FISHES

"It is a pity that so many lovers and students of Nature pay little or no attention to 'the waters under the earth.' Birds and flowers are studied with enthusiasm by thousands, but the animal and vegetable life of the water — particularly the animal life — seems to be overlooked or disregarded, as belonging to a foreign element. This is unfortunate, because there is so much of rare and surprising interest in the study of water life — so many revelations of the wonders of God's creation, so many glimpses into the marvelous resources and adaptabilities of Nature. The life of the water is not only fascinating in its own body of facts, but it is full of surprises and suggestions, now in the way of contrast with the life of earth and air, and now in curious correspondence with it. The study of fishes in particular is most fascinating; and I do not know how the mind of a beginner in Nature study could be more stimulated and broadened than by making a series of observations simultaneously upon fishes and birds. These two great kingdoms are strangely alike and yet unlike. Their contrasts and correspondences are more interesting than any romance, and there is an endless delight in discovering and bringing out new points, both of striking divergence and likeness.

"The waking of the fishes in the spring is a most charming chapter to study in connection with the return of the birds. I suppose there is scarcely one person in fifty who knows that many tribes of fishes, as well as of birds, migrate to warmer waters during the winter, and return, at the same time with the birds, to lay eggs and even build nests as they do. But this is a fact long ago established by scientists; and there may be, if we choose, great delight in knowing and taking advantage of it.

"April is distinctively the month of waking and activity with the fishes, just as it is with the birds; and from then until the middle or latter part of May is the time when both tribes may be studied with the greatest profit and delight. Anyone who lives in the vicinity of brooks, rivers, or ponds, and particularly of streams flowing into the sea, may be sure of rich returns from time spent, during the month of April, in observing the fishes. All waters are then alive with them, while the great instinct and necessity of reproduction is stimulating them to utmost activity, and at the same time bringing out their most interesting habits.

"Let us glance first at the migratory habits of some of our commoner fishes, such as may be found, during the warmer months of the year, in almost any stream larger than a rivulet. Do such fish, for instance, as the perch, the sucker, the sunfish, the bass, the pike, and the brook trout, ever migrate? It is the common impression, I am aware, that they do not, and yet a careful study of their habits proves them to be what we call, among the birds, 'semi-migrants.' That is to say, these fishes pass down from the higher waters of streams to the lower and warmer waters, and very often into larger streams or into ponds and lakes, returning with the waking season in the spring to the shallower waters, where they breed and spend the first half of the year — counting spring as its beginning.

"Every country boy knows, for example, something about the spring migration of the suckers; and when you see him starting out with his 'gigging pole,' or his rod and line, you may be pretty sure that the suckers are beginning to run up some brook that he wots of. So it is also with the brook trout, the gamy and delicious and highly prized *Salmo fontinalis*, as your experienced angler well knows. In April the trout come swarming up the smaller rivers and streams from which they have migrated during the winter. They are coming up to spawn, and to remain until fall, when the downward pilgrimage again begins. The well-informed and skillful angler meets them on their spring migration, when the law allows him to take them. In the fall, however, the season is closed legally, ostensibly because it is spawning time, though as a matter of fact the spawning of brook trout takes place about midway between the spring and fall migrations.

The black bass is another instance of a fish that migrates to deeper water late in the season; and fishermen through the ice of ponds and lakes can testify to the great increase in the number of perch, pickerel, etc., during the winter, as these fishes come out from the ponds and creeks to warmer and more protected depths. And so I think we may claim that there is a semi-migration of many of our commoner fishes twice a year, just as there is of robins, blue jays, crows, flickers, and other familiar birds, that do not entirely leave the temperate zone in their search for a warmer climate in winter. Here, then, is one pleasing correspondence between birds and fishes — that a certain number of both tribes are limited or semi-migrants.

"A further and more marked correspondence may be observed in the case of certain salt-water fishes, particularly those that spawn in fresh-water streams — the anadromous fishes, so called. These fishes make extended southward migrations, just as the majority of birds do, and return at the same season in the spring — the great waking and home-returning month of April. At the same time that the mighty army of birds is speeding northward, what we might call the fleet of the fishes is accompanying them along the coast; and we may trace the progress of the latter by the successive dates when they ascend the coast streams, beginning to do this as early as January in the Savannah River, and continuing gradually northward, until the New England coast streams receive them in April and early May. The names of these fresh-water breeding migrants among the fishes are familiar to nearly all dwellers along the coast — the herrings, alewives, shad, and salmon. But hosts of other sea fishes, that do not spawn in fresh water, are migratory, and come northward at the same time with the birds, only we cannot trace their journeyings as exactly as we can those of the anadromous fishes.

"Now let us turn for a moment to that other curiously birdlike habit of certain fishes, when they, like the birds, are waking to the joys and responsibilities of family life; namely, nest building. The majority of fishes, to be sure, like some birds, lay their eggs without providing any nests for them, but certain species are very particular about the homes and safeguards of their offspring. The rock bass and the two varieties of black bass are well-known examples. These fishes scoop out a hole with their fins in the bottom of the stream, and then bring pebbles or small stones to the bowl-like cavity, to which the female attaches her spawn, mounting guard over the nest until the eggs hatch, which is generally within ten days. Any offending object dropped upon or near the nest is promptly and indignantly removed.

"The sunfish, or 'pumpkin seed,' also scoops out a nest in the bottom of the stream, but does not ballast it with pebbles. Her nest is large and deep, however, and built in comparatively still water, where the unattached eggs are not likely to be carried away by the current. The female not only watches over the eggs till they are hatched, but drives away every intruder, even of her own species, that ventures to approach the spot.

"The stickleback's nest, however, is the most remarkable of all fish nests, most like a bird's nest, being built of grass and weeds, fastened together with slime from the fish's own body. There is a hole entirely through the nest, from one side to the other, provided in order that water may constantly flow over the eggs. In the case of the stickleback, curiously enough, it is the male that builds and defends the nest.

"The correspondences between bird and fish life which I have hastily sketched serve to show that a fascinating study may be made of the inhabitants of the water, if one is willing to devote the necessary time and attention to the subject. I might mention other water tribes besides the fishes whose life history is full of interest and wonder. But my object is accomplished if I have in any degree induced other students of Nature to look into those crystal wonder depths for themselves, and especially at a time so rich in all the operations of life, and so fruitful in disclosures and surprises, as the joyous month of April."

ALONG THE LILY PADS

"Under the broad green leaves of the water lilies, that fringe the edges of lakes, ponds, and slow-flowing streams, there lurks, during the warm months of the year, that watchful privateer of fishes, the true pike, *Esox lucius*, more commonly and incorrectly called pickerel. The real pickerel is a smaller, less distinctly and brilliantly marked fish, of a dull-greenish hue. It frequents the same waters and lurking places as the pike, and is, perhaps, equally voracious and gamy; but its inferior size and strength and duller markings make it seem less of a prize to the keen fisherman who casts his minnow or his troll into the dark, still-flowing water. In rivers and large creeks the pike seems to exceed in numbers his smaller and weaker cousin, the pickerel; but where the stream is only a few yards wide, and flows between reedy borders, in low-lying meadows, very seldom does the angler add one of the great spotted pike to his catch. His string or creel will be made up chiefly of the greenish grass-pickerel, ranging from a quarter of a pound to two pounds in weight, with, probably, a welcome sprinkling of large perch, which take the troll almost as readily as the pickerel itself.

"There are two methods of fishing for pike and pickerel. One is to troll from a boat, rowed or paddled slowly and cautiously along the edges of the weeds and lily pads, with a trailing line of from forty to eighty feet in length, to which are attached a polished metal spoon and gang of hooks. The other is the method of fishing from land. The angler walks leisurely along, at a little distance from the bank of the stream, so as to be out of sight, and casts his troll or bait with a rod. For small streams, where the use of a boat would be impracticable, fishing from the land is, of course, the only method; and some anglers, of active bodily habits, prefer it even for lake or river fishing, as being, on the whole, a more skillful and sportsmanlike method, furnishing both greater variety of sport and superior physical exercise.

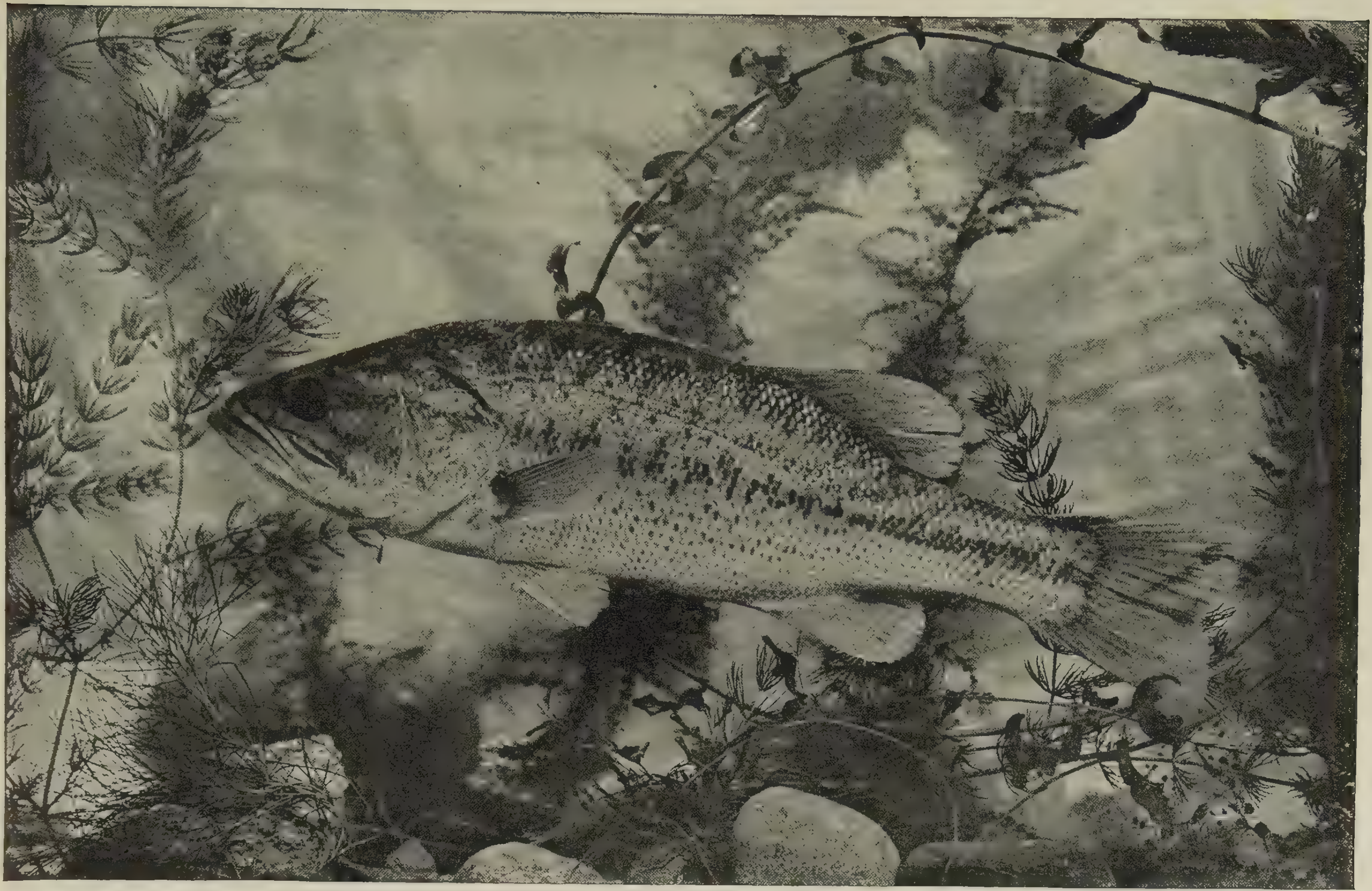
"But on a lazy summer day there certainly is a fitness and charm about fishing at one's ease from a boat along the lily pads, waiting with a pleasant anticipatory thrill for the tug on the line that announces the strike of pike or pickerel — a charm that one misses if tramping along the bank in the sweltering sun. Even if the angler serves as his own oarsman, facing the stern, with the line gripped in his teeth, the exercise is necessarily so gentle and almost dreamily dallying, as to seem little more than a rhythmic swaying of the body, in harmony with the languid pulsations of air stealing over the meadows. The old and accustomed fisherman, by a kind of instinct or clairvoyance, divines the windings of the stream, and urges his craft noiselessly along, keeping always just outside the fringing weeds and lilies, that his hooks may not foul in them. Even the novice finds that an occasional quick, sidewise glance enables him to keep his bearings, and he soon acquires the art of feeling his way along, while his attention is concentrated chiefly on the taut line that throbs and vibrates in his teeth.

"The angler who has never fished with his teeth has missed a certain subtle, keen refinement of nerve excitation that must be experienced to be appreciated. There is an exquisite delicacy and minuteness of report constantly flashing over the nerves to the brain. Every throb and quiver of the spinning spoon, every slightest obstacle it encounters on its way, the swing of the straining line across a bend in the stream, the impact of a reed or lily stem along which it drags for a moment, the slight snap of the merest tendril caught by a hook, and the leap of the spoon as it is released, the very rush of the pike or pickerel from his hiding place, and the preliminary shock of contact with the hooks ere the sudden tremendous tug of the strike itself — all these submarine secrets are telegraphed to the angler's brain through the delicate, sensitive nerves of the jaw, while he sits expectant, with his fifty feet of line between his teeth. I have heard it said that sometimes a fisherman loses a tooth when a monster pike grabs his hooks; but if so, the man must either be asleep or of the dullest and most phlegmatic nervous temperament, for I have never known an instance when there was not ample warning, from the initial contact of the fish with the spoon or minnow, for catching the line with the hand in season to meet the tug and surge of the strike.

"Some fishermen use a very short, thick rod in trolling alone from a boat, laying the rod with the butt under one thwart and the tip over another, or holding it between the legs. I have also seen anglers carry the line at the tip of a small stick, about six inches long, which they held in one hand as they rowed. But it has always seemed to me that this method must impart an uneven and erratic motion to the spoon, and also make it liable to sink and foul.

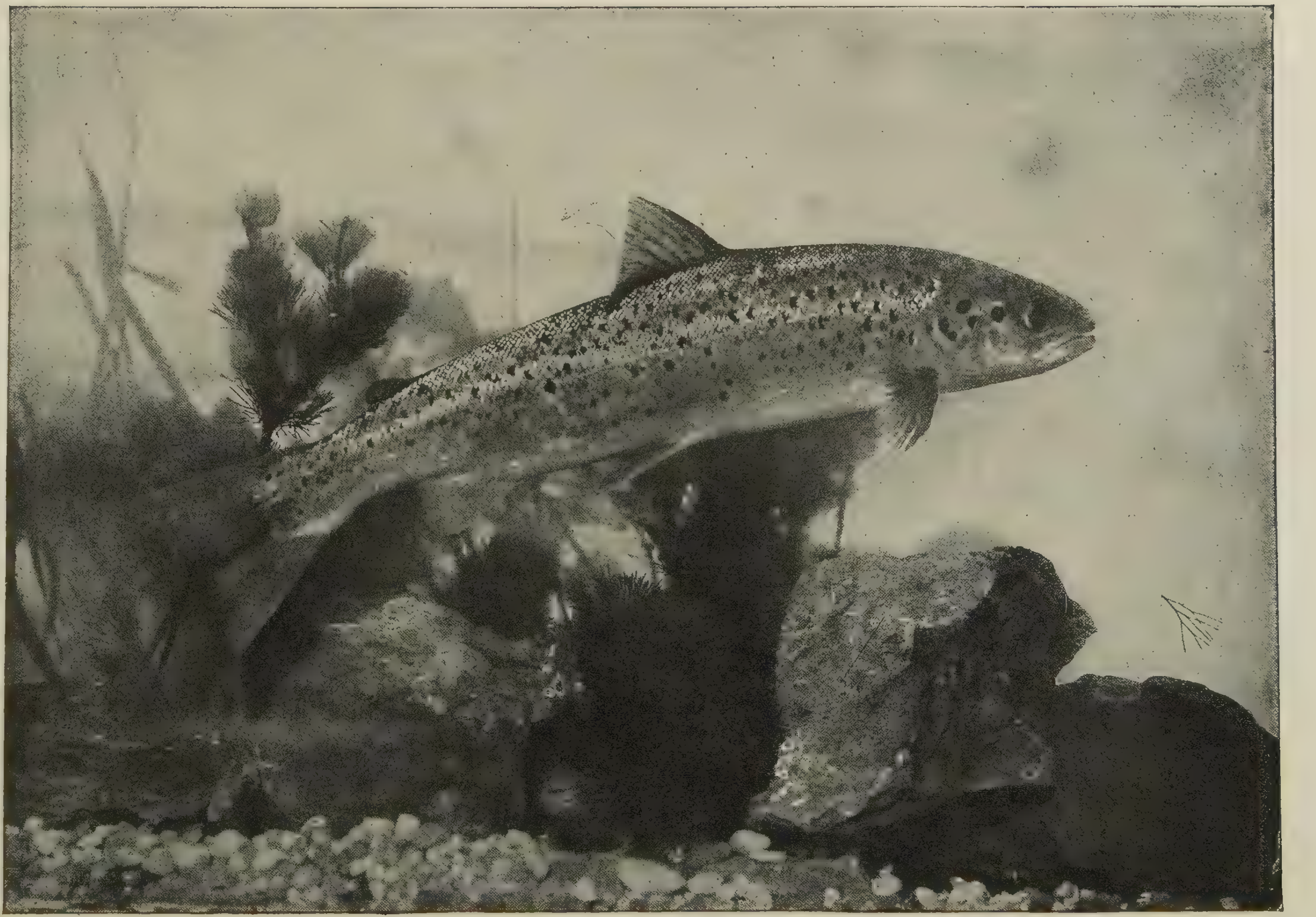
"The ideal trolling ground is a small, deep, sluggish river, winding through low meadows, with now and then a lofty deciduous grove, deep with shade and coolness, or a wooded ridge thrusting down to the water's edge and breaking the quiet of the lowland scenery with a picturesque bluff or cliff. There is an indescribable charm about winding in and out, to and fro, with the sinuous meanderings of such a stream; the scenery constantly changing, and yet preserving a sort of panoramic unity and continuity; sunlight alternating with shadow on the still-flowing waters; the song of some hidden veery or sparrow coming to us out of the cool gloom as we drift along the woods; and in the broad sunlight beyond, the silence of shimmering meadows and the grateful touch of the breeze that brings to us the fragrance of new-mown hay.

"Of such things as these, as well as the thrill and stimulus of healthful sport, is the angler's joy compounded. The secret of it all lies in being close to Nature's heart, with something concrete, definite, and universally attractive to draw one and hold one there."

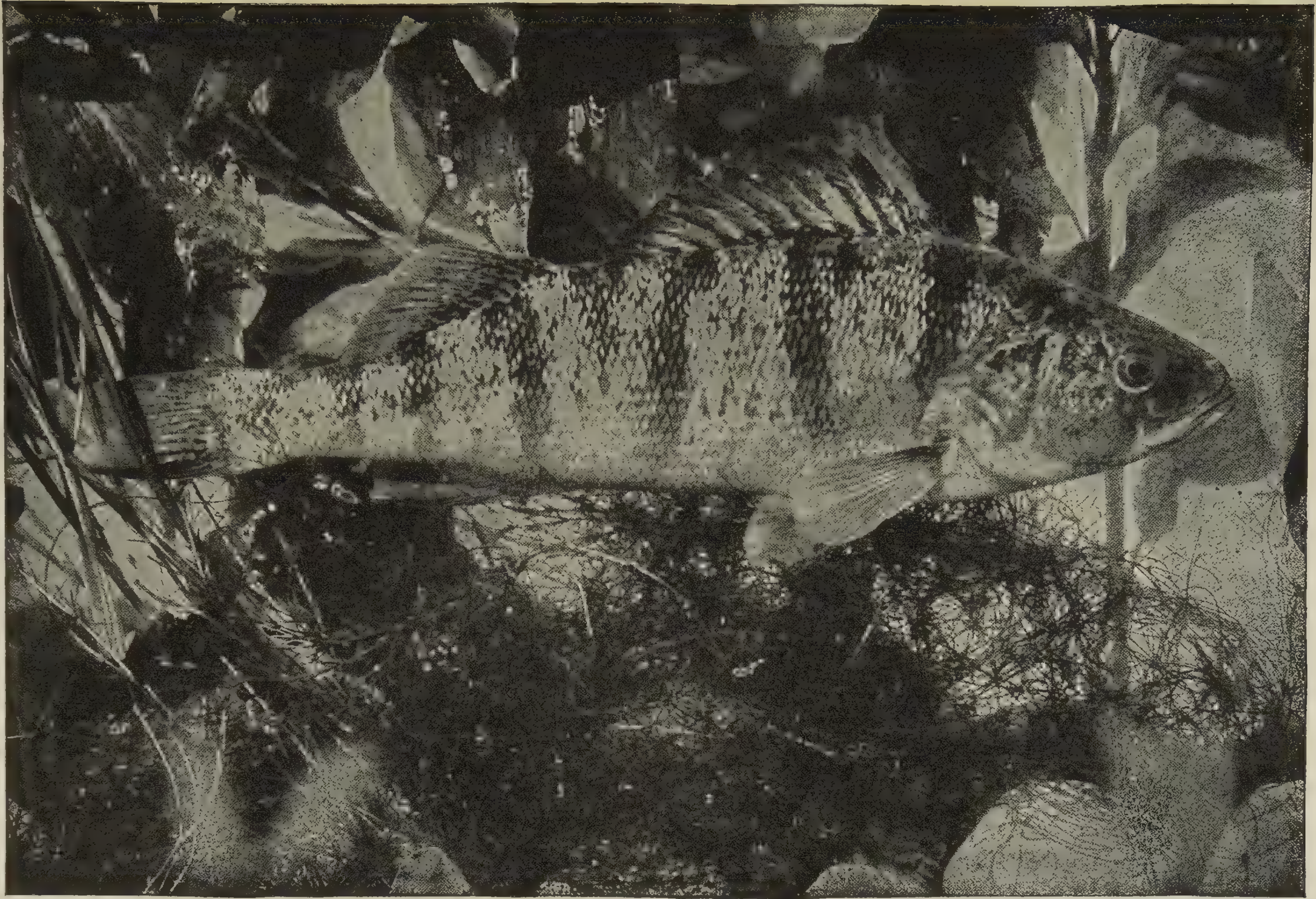


LARGE-MOUTHED BLACK BASS (*Micropterus salmoides*)

One of the gamiest of the smaller fishes.

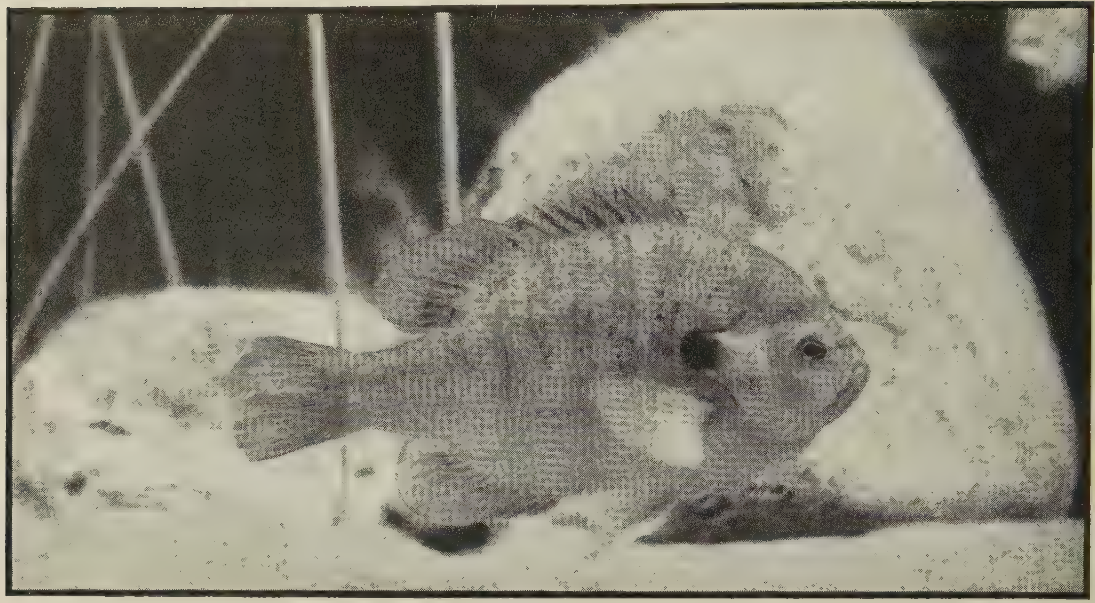


LANDLOCKED SALMON (*Salmo sebago*)



YELLOW PERCH (*Perca flavescens*)

One of the most abundant and best known of the fresh-water fishes.



Courtesy Shedd Aquarium, Chicago

BLUEGILL SUNFISH (*Lepomis pallidus*)

SOME OF THE HUMBLER FISH FOLK

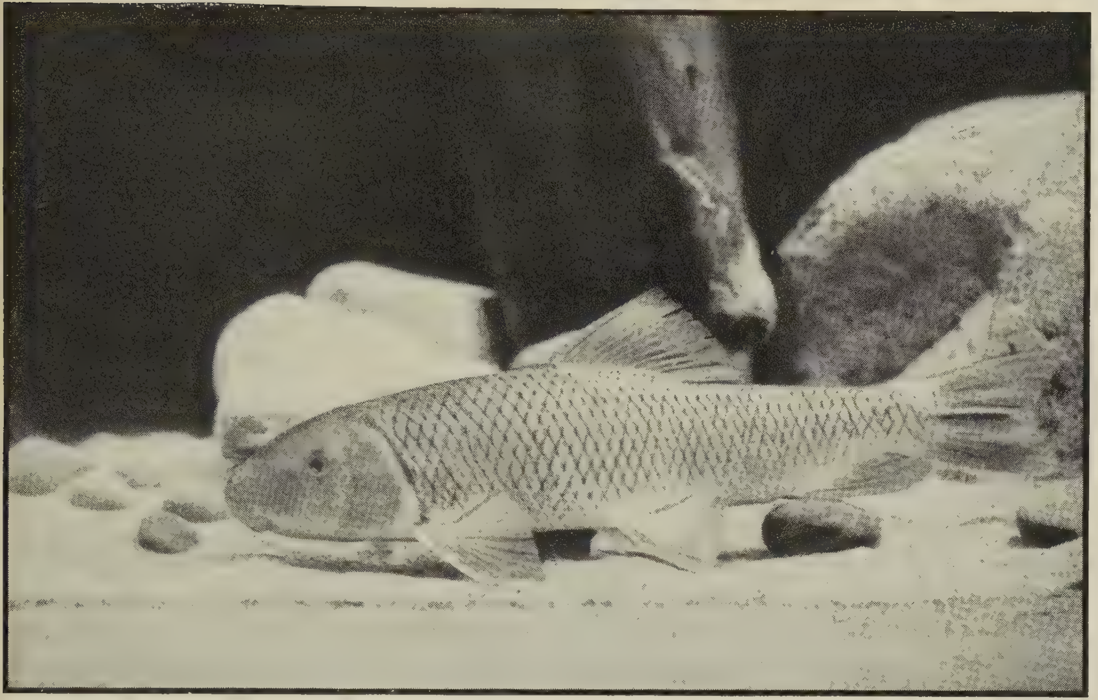
Humble? I say that out of modesty, thinking rather of myself as a sportsman than of the fish. For where I lived when I was a boy my line was never dry; the most exciting fishing was that for pickerel, or rather pike, from along the margins of the ponds. There were no trout streams in the warm, sandy levels of southern New Jersey, no rushing, foaming brooks, no cold mountain falls. "Punkin seeds" and "catties" and white perch down the creek and raccoon perch in the ponds — these were the game we went after. I have helped net shad in the Cohansey, and sturgeon in the Delaware; I have been offshore for sheepshead; but for real and exciting sport with the rod, it was such as Izaak Walton usually had — serene and meditative beneath some willow along the margin of the pond with a cork, or off the lumber wharf with a "throw-out" line pulling taut in the tide.

And I have fished for splendid rainbow trout in the wildest mountains of the West, where an angler's line does not touch the deep, dark pools once in a dozen years, and where there *is* fishing, as a fisherman would say; but for all of that, and notwithstanding the glory of such a trout as a three-pound rainbow, still I like an alder pole, and a pickle-bottle cork, and a willow tree or the wing of a bridge to fish from, and there cast my line, sitting quiet while the tide turns and the fish tarry for an appetite. I like to sit and fish. One has to have an excuse for sitting nowadays; and inward quiet, quiet to the core — that can be had by baiting your hook with your business and waiting for a bite.

THE LURE OF THE TROUT

Among our game fishes none stands so high in the estimation of the run of anglers as the Eastern brook trout. Our literature is full of trout. They leap into the pages of every lover of the out-of-doors. And no matter how ardent a protector of wild life he may be, I have yet to see the real Nature lover who could resist the wiles of the trout.

"It is when this temperate zone of ours, and these rugged landscapes to which most of us are accustomed are all pink and white and fragrant with the blossoms of orchards," says one of these gentle lovers, "that angling time



Courtesy Shedd Aquarium, Chicago

COMMON REDHORSE SUCKER (*Moxostoma aureolum*)

is at its height. Old fishermen say that it is little use to wet a line for trout until you can smell the apple blossoms. I have angled for all kinds of fresh-water fish, from the time when the ice first went out until the law forbade, but I have never had any success worth mentioning (except with the cold-blooded and phlegmatic sucker) until the fruit trees were fully in bloom and their sweetness was blown into my face on puffs of air as warm as a draught from a florist's conservatory. Not until then does the water of our lakes and streams lose enough of its winter chill to wake its inhabitants fairly out of their torpidity. The trout, generally speaking, will not rise to a fly until June, nor pay much attention even to the seductive worm until the first of May. And, to a less marked degree, other fresh-water fish are sluggish during the same period. But when those first spring heats come on, which make you think that even midsummer will scarcely bring you a greater desire to 'sit in your bones,' then is the halcyon time to go a-fishing. Then is the time when, if you are a true angler born and bred, to be chained down to desk or shop or classroom will make you actually sick in body as well as in mind. The angler who reads these lines will not smile, I am sure, at the confession that I once had a serious fit of illness brought on not otherwise than by a persistently thwarted longing to get to the woods in angling time. Circumstances were such that I could not leave my post of duty even for a day; but the struggle to smother my passion was so severe that, after the witching time had passed, my system collapsed, and I was perforce a non-producer for three months. Three days of fishing would have saved me three months' time — the more's the pity! It was the being unable to go at all that laid me low. I appeal not to the uninitiated for sympathy, but every genuine angler will understand."

One of the most thrilling starts my nerves ever experienced I had not long ago while casting for trout on the Imnaha River in the Joseph Mountains. The cañon was narrow, the holes deep, and the stream a rapidly rushing torrent

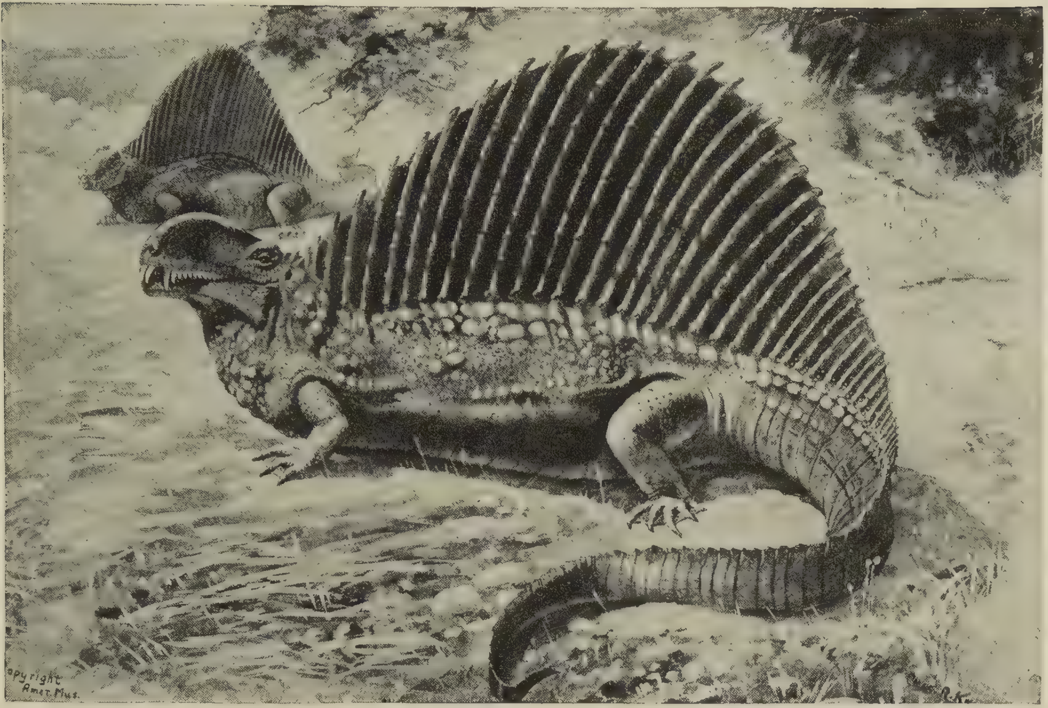
COMMON BULLHEAD; HORNED POUT (*Ameirus nebulosus*)

of Western "white" water — a peculiar color that "crystal" and ordinary Eastern terms do not describe.

As I stood alone amid the dark shadows of the overhanging firs and crags, my eye ranging the transparent depths of the hole where a shaft of sunlight struck its bottom, I was suddenly startled by a streak of red, a flash of fins and tail, and into the pool the swirl of a mighty salmon. It surely weighed twenty pounds and seemed to fill the hole. I nearly lost my wits for a moment and thought of man-eating sharks, for it was my first salmon. I had seen them caught in the Columbia, and up the Clackamas where you remember Kipling tells us he caught them; but here I was a hundred miles into the mountains, away up on a branch river, and to have this mighty ranger of the Pacific plow his way through the shallows at my very feet was a vivid experience.

But when it comes to fish stories, I lay down my pen. Any one of my readers can beat his neighbor with a fish story. My biggest story would have to be an eel that tied fourteen different kinds of knots in my line and then — but I have other things to show you and other tramps to take with you besides these a-fishing.

COMMON EEL (*Anguilla chrysypa*)



Courtesy of American Museum of Natural History

TWO REPTILES OF PREHISTORIC DAYS

REPTILES

TORTOISES, TURTLES, AND TERRAPINS

THE North American Chelonia is composed of tortoises, turtles, and terrapins. The two latter names are employed rather indiscriminately in different portions of this country, but the appellation "terrapin" is generally applied to the hard-shelled, fresh-water species that are edible and consequently have a market value. The tortoises are strictly terrestrial Chelonians.

My earliest outdoor memories go back to reptiles. One of the first things I remember was my old Quaker grandfather lifting some kind of snake out of the path with his cane and saying to me, "Thee must not harm any of God's creatures." I think I have always felt kindly toward snakes on account of that simple experience. Until I was eight years old I lived beside the Maurice River, up and down whose high banks I wandered with fish pole, over whose broad meadows and swamps, summer and winter, I tramped, with my brothers tending their traps and fish nets. Naturally the largest and commonest of the river creatures to be seen were the turtles, big "snappers" that often weighed twenty-five pounds each. The ditches too were full of "red bellies" and mud turtles and speckle backs, with now and then the rarer and highly prized diamond-backed terrapin. Besides, in the upland woods lived the common box turtle, upon whose shell I scratched my initials before I had learned the whole alphabet.

THE PREJUDICE AGAINST REPTILES

The average young reader of this book will perhaps not share with me this interest in reptiles, yet I notice whenever I visit a zoölogical garden that a crowd of children always stands about the reptile cages. Is it because of fear and dread? Or is there something peculiarly fascinating about these lowly denizens, some of them so deadly and all of them so scaly and crawly and sinister-looking?

The older we grow the more dislike we have of reptiles, a dislike for the most part founded upon ignorance and prejudice and make-believe. Take the whole kingdom of reptiles, the present live members and the ancient fossil ones, individually and in all their relationships, and I doubt if any animals will repay one for one's study more than the reptiles.

Take them as a whole and they are the friends of man — valuable for food and for the work they do, as most of them, especially the snakes and lizards, feed upon obnoxious insects and rodents. Their habits are interesting and easily studied in the case of many of them, much more easily than the fishes or shier mammals. You can scarcely turn to an intimate account of a naturalist's life without finding a pet turtle or toad or other reptile in it.

GILBERT WHITE'S TURTLE

Did you ever read "The Natural History of Selborne," by Gilbert White? It is one of the books you will surely read, a quaint, simple account in letters to friends of the birds and reptiles and other living things about his rectory (he was a clergyman) in Selborne, England.

One of the most charming chapters in this famous book is that referring to his tame tortoise. The creature had been kept in a Sussex garden for over thirty years.

That tortoise of Gilbert White's corresponded very closely to our common box turtle—more closely to our gopher tortoise of the Southern states — a creature that every child of the woods from New England, south and west, well knows. Here in Massachusetts it seems to me very rare (I have never found one in my neighborhood), but no animal is more abundant farther south.

HABITS OF THE BOX TURTLE

If you want an interesting and an easily kept pet and one that will *last*, capture a box turtle — pick one up, I should say, and carry it home.

There is no reptile possessing greater immunity from harm than the box turtle. Once its shelly fortress is closed, there are few living creatures (except man) that can harm the fleshy parts within. Other turtles, although withdrawing the head and limbs within the shell at times of danger, are in much the same predicament when discovered by a hungry animal as the proverbial ostrich that buries its head in the sand to "conceal" itself from harm. Sharp claws, or the talons of the birds of prey, can readily tear the exposed fleshy parts of the ordinary turtle from its shell.

The muscles that close the plastron, or under shell, are of great power. It is by no means an easy matter to pry the shells apart, even with strong hands and a chisel. Some specimens are so fat from feeding during the blackberry season that they are unable to close both lobes of the under shell simultaneously—the pressure of one half of the lower shell upon the fleshy parts forcing open the other.

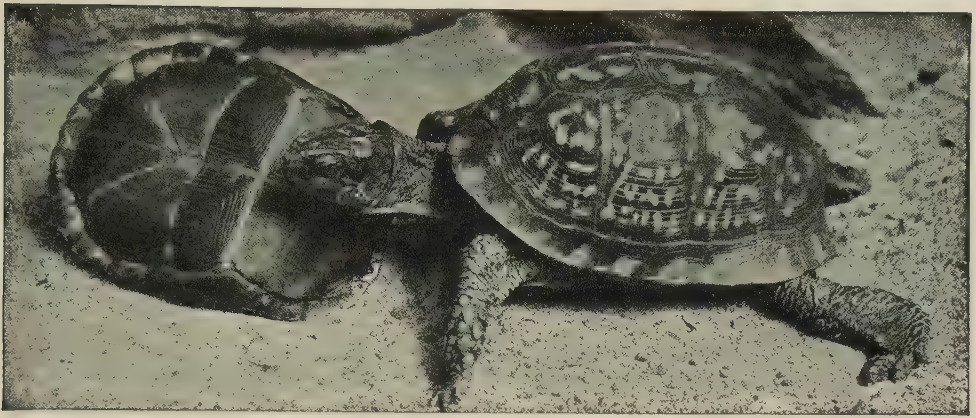
The box turtle is strictly terrestrial and its habits tally closely with those of the true tortoises, although it is of a wandering disposition and does not dig permanent burrows. It is most abundant in situations where open, grassy spots alternate in sparse thickets. The food consists largely of vegetable matter such as mushrooms and berries, though the larvæ of insects are eaten, as well as earthworms and slugs. During the periods when blackberries ripen the turtles show evidences of feasting — by their stained jaws and fore feet. They are often taken red-handed, too, in strawberry beds.

Like other terrestrial Chelonians, the box turtle lives to a great age. Specimens that were old and worn quite smooth when captured have thrived for ten or fifteen years in captivity; while Gilbert White's pet was known to be much older.

In Letter VII he writes: "The land tortoise which has been kept for *thirty* years in a little walled court belonging to the house where I am now visiting, retires underground about the middle of November, and comes forth again about the middle of April."

That letter was dated April 12, 1772. It ran:

"Dear Sir,—While I was in Sussex last autumn my residence was at the village of Lewes, from whence I had formerly the pleasure of writing to you. On the first of November I remarked that the old tortoise, formerly mentioned, began first to dig the ground in order to the forming its hibernaculum, which it had fixed just beside a great tuft of hepaticas. It scrapes



COMMON BOX TURTLE (*Cistudo carolina*)

An inhabitant of the Eastern states. Notice the specimen on the left which is "folded up."

out the ground with its fore feet, and throws it up over its back with its hind; but the motion of the legs is ridiculously slow, little exceeding the hour hand of a clock. Nothing can be more assiduous than this creature night and day in scooping the earth, and forcing its great body into the cavity; but as the noons of the season proved unusually warm and sunny, it was continually interrupted, and called forth by the heat in the middle of the day; and though I continued there till the 13th of November, yet the work remained unfinished.

"Harsher weather, and frosty mornings, would have quickened its operations. No part of its behavior ever struck me more than the extreme timidity it always expresses with regard to rain; for though it has a shell that would secure it against the wheel of a loaded cart, yet does it discover as much solicitude about rain as a lady dressed in all her best attire, shuffling away on the first sprinklings, and running its head up in a corner. If attended to, it becomes an excellent weather glass, for as sure as it walks elate, and as it were on tiptoe, feeding with great earnestness in a morning, so sure will it rain before night. It is totally a diurnal animal, and never pretends to stir after it becomes dark. The tortoise, like other reptiles, has an ordinary stomach as well as lungs; and can refrain from eating as well as breathing for a great part of the year. When first awakened it eats nothing, nor again in the autumn before it retires; through the height of the summer it feeds voraciously, devouring all the food that comes in its way. I was much taken with its sagacity in discerning those that do it kind offices; for, as soon as the good old lady comes in sight who has waited on it for more than thirty years, it hobbles towards its benefactress with awkward alacrity, but remains inattentive to strangers. Thus, not only 'the ox knoweth his owner, and the ass his master's crib,' but the most abject reptile and torpid of beings distinguishes the hand that feeds it, and is touched with the feeling of gratitude!

"I am, etc., etc.

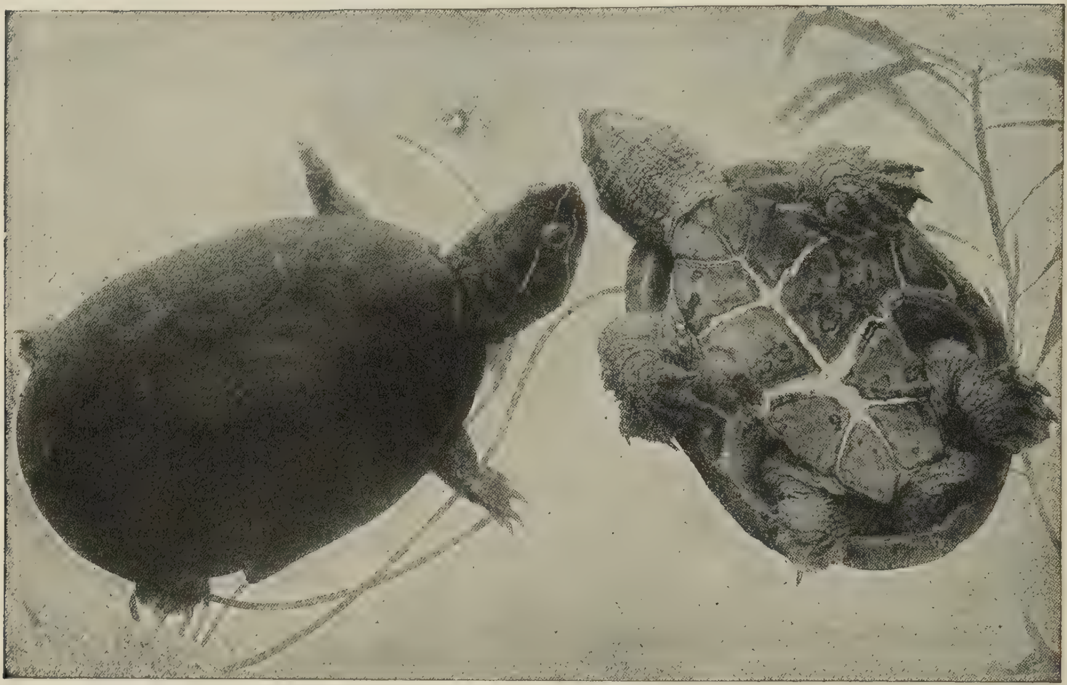
"P. S.— In about three days after I left Sussex, the tortoise retired into the ground under the hepatica."

Ten years later, in a letter dated Selborne, April 21, 1780, the dear old rector wrote:

"Dear Sir, — The old Sussex tortoise that I have mentioned to you so often is become my property. I dug it out of its winter dormitory in March last when it was enough awakened to express its resentments by hissing, and, packing it in a box with earth, carried it eighty miles in post chaises."

That makes at least forty years for that tortoise. No one knows how old it was when captured.

Our box turtle also digs its winter dormitory in the ground — down below the frost line. Mr. Ditmars, curator of reptiles in the New York



COMMON MUSK TURTLE (*Aromochelys odoratus*)

Abundant in muddy rivers of eastern North America. Often takes the hooks of fishermen, and when handled gives out a strong, musky odor. You will know him — he has taken your bait many a time.

Zoölogical Park, tells in his "Reptile Book" this story of finding one:

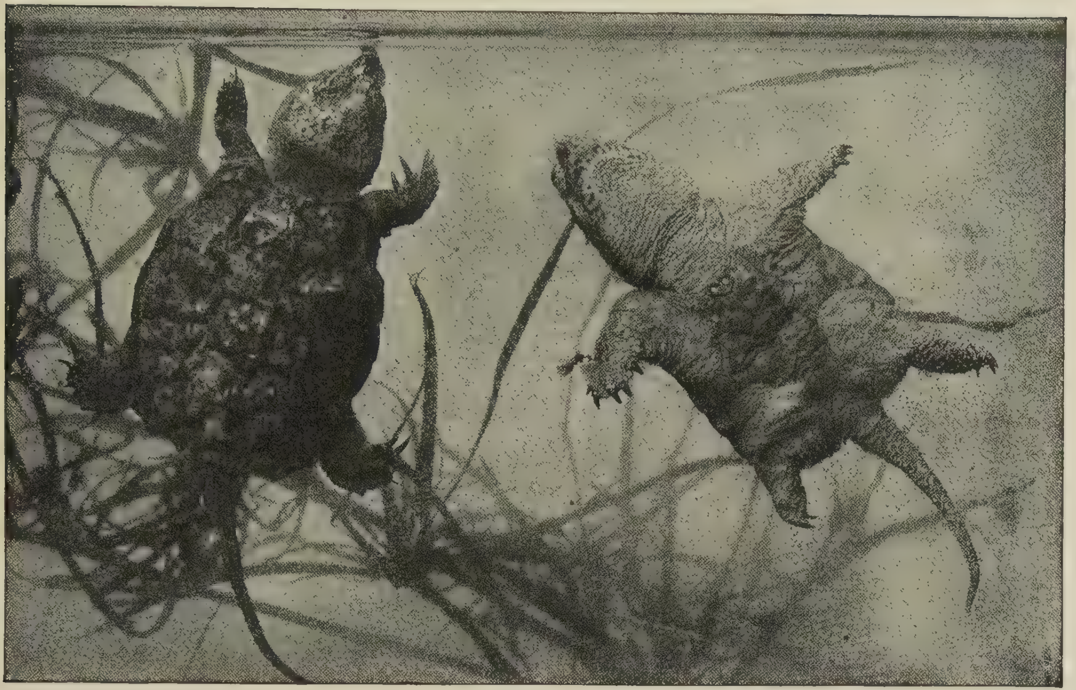
"A friend of the writer was engaged in the melancholy duty of digging a grave for a large pet dog. The animal had died in January and a severe frost had hardened the ground for a distance of five inches. After breaking through this it was easy digging, and as the gentleman had reached a depth of about two feet he unearthed a box turtle, which showed feeble signs of life."

THE SEA TURTLES

"While normally inhabiting the waters of the warmer latitudes," says the authority quoted above, "the sea turtles are often enticed northward, along our eastern coast, by the mild currents of the Gulf Stream; during the midsummer months they enter the northern harbors and live comfortably enough, but during the approach of cold weather these wanderers become chilled and stupefied, and fall an easy prey to fishermen. Benumbed during the fall hurricanes, they are battered and cast lifeless upon the beaches of Long Island, Connecticut, and Massachusetts, and by the very storms that originated over their native seas."

Among all the multitudes of sea fishes and other living forms there are only five species of sea turtles, all of them familiar to us who live in the coast cities where the fishing boats are occasionally bringing them in to the wharves. Except for the hawksbill, from which comes the beautiful "tortoise shell" for combs, they are gigantic forms, as fits the sea, and valuable for food — the green turtle ranking first among them for this use.

The great loggerhead turtles lay their eggs along the Florida coast. The female scoops a hole in the sand, deposits the eggs therein, and shovels the sand back over them; she then retires to the sea, paying no more attention to them. These are the only times — in May and early in June, along our shores — that the adult turtle leaves the water; the eggs are deposited above tide line. Six to eight weeks cover the period of incubation, and as the young turtles



YOUNG SNAPPING TURTLE (*Chelydra serpentina*)

Very young specimens have an exceedingly rough shell.

hatch they at once seek the water. Their progress is seldom toward the open sea, for they have little power to battle with the surf. They seek shallow inlets and here find partial protection from their many enemies in the shape of the larger fish and the sea birds. The number of eggs deposited is enormous; it varies from fifty to a thousand, according to the size and the age of the female.

When the green turtles are brought alive to market you will see them turned over on their backs in the restaurant windows. This is necessary as, the turtle being adapted to a life in the water, the plastron is soft and unsupported; when placed upon it, the weight of the reptile so presses against the under shell that it is forced against the lungs and other internal organs and the turtle soon dies from an inability to breathe.

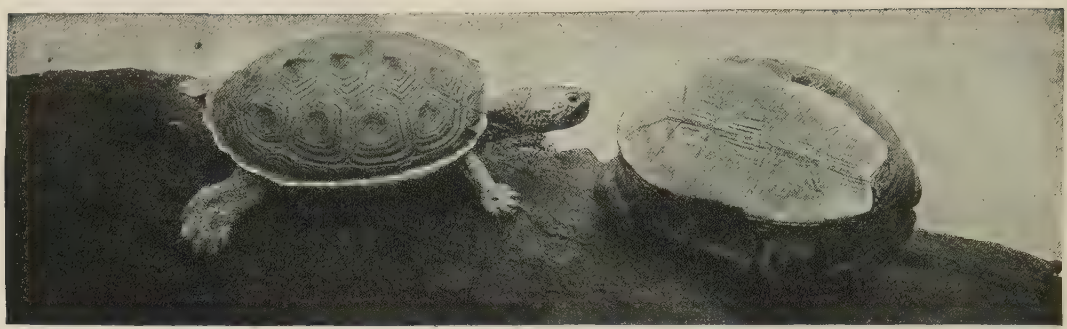
THE SNAPPING TURTLE

"Get your probe, and come; we 're going after snappers," used to be a familiar cry to me when a boy. As between the flavor of a snapping turtle and the almost priceless diamond, I don't believe the average connoisseur could tell the difference — in soup! That is, as mother used to make snapper soup.

The snapper is a vicious brute to bite, taking a hold and never letting go, and with the strength of Samson in his dreadful jaws. These turtles hibernate in the mud of the meadow ditches, and we used to find them with a long iron rod by probing up and down till we struck the hard shell of his back, then with a long hook pulling him out.

Now and then we could get one in our fyke nets or on a hook of our "lay-out" line; and frequently found them in the summer when they came up into the fields to lay. Mr. Ditmars says of their breeding habits:

"In the early summer, the female leaves the pond or stream and prowls about for a place to deposit her eggs. Selecting a damp spot, she scoops away the earth to form a hollow, into which she crawls and moves about until the loose soil falls back over her. Thus she is hidden until the eggs are deposited, to the



FULL-GROWN DIAMOND-BACKED TERRAPIN (*Malacoclemmys palustris*)

number of about two dozen. As she crawls forth the shell is reared to a sharp degree and the earth that has fallen upon it is left covering the eggs. They are perfectly round, white, and with a thin, hard shell.

"As the snapping turtle is persistently aquatic, the shells of many specimens become coated with moss. As they lie partially buried in the mud, in shallow water, they look much like flat stones. In such places they remain for hours, poking the extreme tip of the snout from the water to breathe. They are able to remain for long periods entirely submerged and will dive to the deepest portions of rivers, where they prowl along the bottom in search of food.

"The snapper is voracious, and is not particular as to its fare. One in your duck pond means death to the flock. Young water fowl are stalked from beneath the surface, seized by a dart of the jaws, and pulled below to drown and be quickly torn to pieces by the keen mandibles assisted by the front limbs. The turtle is entirely carnivorous. It never feeds except under water, but it will sometimes seize its prey on the bank of a stream, then retreat into the necessary element. To keep one of these reptiles in water so shallow that it is unable entirely to immerse its head, and supply it regularly with the most tempting food, would ultimately result in its starvation. It appears that the reptile is unable to swallow unless the head is under water."

There are two American snapping turtles, the common snapper of the Northern waters and the "alligator" snapper of the Mississippi River. The latter sometimes reaches a weight of one hundred and forty pounds.

MUD TURTLES AND TERRAPINS

There is absolutely nothing of beauty or interest in the mud-turtle family, as compared with the terrapins and others. With this picture of the common "stink pot" or musk turtle, let me pass them by just as quickly as you can get the hook out of his mouth and drop him in the bushes, hoping he won't get back into the pond until your day's fishing is done.

No haunter of the ponds needs to be told the appearance and habits of the painted turtle, that suns himself upon the stumps and floating logs and slides into the water with a plunk at sight of anyone approaching.

The term "terrapin" is a convenient one, for under this appropriate, popular head we may group all of the North American "turtles," or semi-aquatic Chelonians, except the soft-shelled turtles (*Trionychidæ*), the snapping turtles (*Chelydridæ*), and the musk turtles (*Cinosternidæ*).

There are three genera — the largest *Chrysemys*, of which the painted turtle is a member; *Malacoclemmys*, of which the diamond back is a member, and *Chelopus*, of which the mud turtle is a member.

The box turtles, of which I have already spoken, are remarkable for having the plastron (under shell) hinged, and living a strictly terrestrial life. They seem to be the connecting link between the aquatic reptiles and those of the land. Of the six species the "common" and the "semi-box" are most frequently met with in the Eastern states, while the painted box and the three-toed box occur most frequently in the South and West.

THE TORTOISE PROPER

"The greater number of the true tortoises inhabit the Old World. They comprise four very closely allied genera. The largest genus is *Testudo*, which is made up of about thirty-eight species. All of the New World species belong to this genus. Three occur in North America proper (in the extreme southern portions of the United States); three inhabit Mexico, Central America, and northern South America, and a number are confined to the Galapagos Islands. The latter are huge tortoises, whose generations are supposed to have survived the age of giant reptiles.

"The tortoises are easily distinguished from the turtles by the club-shaped feet of the former in place of the webbed feet of the latter, and the high, domelike shell. The skin is dry and wrinkled. Their method of placing the hind feet, when walking, and the peculiar formation of these appendages, at once suggest (in miniature) the feet of an elephant.

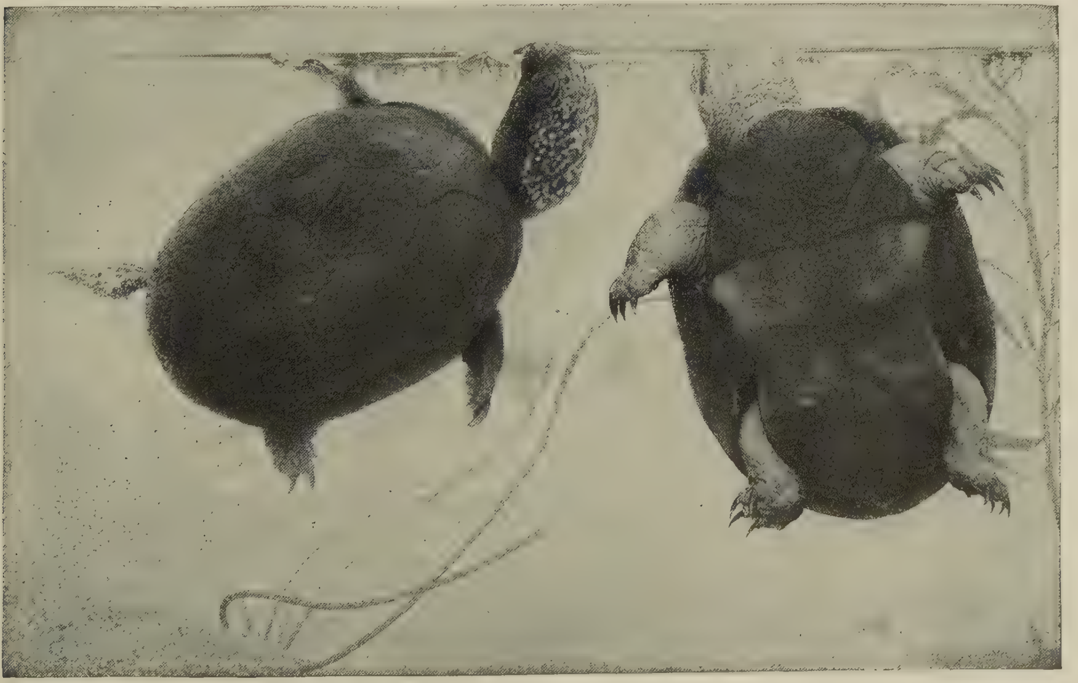
"All of the tortoises are strictly terrestrial, and if forcibly thrown into water are clumsy and almost helpless. A large number of species frequent arid situations — some, the deserts proper. Many dig deep furrows, into which they retire during the great heat of midday. The larger part of the food of these creatures consists of vegetation and fruit.

"The three species of tortoises inhabiting the United States are remarkably similar in coloration, all being of a dull, brown hue. They evince similar habits in selecting dry, barren areas, and digging long burrows in which to shelter."

Thus are the tortoises described in "The Reptile Book" by Mr. Ditmars. The gopher tortoise is the one we know best, occurring in considerable numbers in the Southern states, where it burrows in the dry, sandy regions amid the scrub oak and wire grass. It prowls about on cloudy days and evenings in search of vegetable food, feeding on any succulent stuff, being very fond of lettuce and celery when in captivity.

THE SOFT-SHELLED TURTLES

One more distinct American turtle you will occasionally meet — the odd soft-shelled. The



COMMON MUD TURTLE (*Cinosternum pennsylvanicum*)

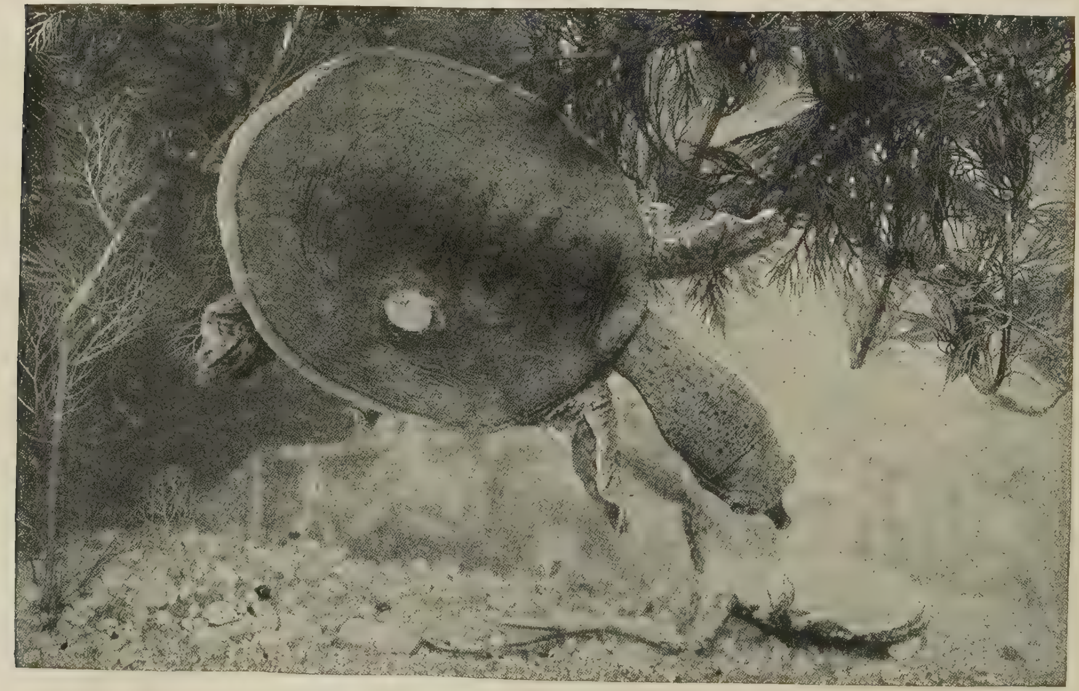
A dweller in eastern North America.

shell is exceedingly flat and in its outline is either bluntly oval or almost circular and soft and leathery.

The neck of the soft-shelled turtle is long, the head is narrow, and the snout is provided with a slender proboscis. While the general appearance of these creatures is fleshy and inoffensive, and the jaws are provided with liplike folds of skin, the latter cover powerful and keen-edged jaws and these reptiles bite with the energy of the snapping turtles. The head and neck are completely retractile. As they are aquatic, the feet of these turtles are broad and extensively webbed.

Mr. Ditmars says of these turtles: "Old logs, protruding a moist and slimy surface a few inches from the water, sometimes tempt these creatures from the element for which they are specially provided. In such situations they lie taking a sun bath, with limbs withdrawn beneath their flabby 'shells' and their long necks stretched to the fullest extent, imparting the idea of as many snakes, emerging from under flat stones. At the least alarm they scramble frantically for the water, but upon reaching it their clumsy movements are instantly transformed. Against the resisting surface, the broad, finlike feet take great purchase and the frightened reptiles disappear with almost the agility of a scurrying school of fishes. While displaying the same habits as most reptiles — the flight for shelter if the coast be clear — the soft-shelled turtle at bay is one of the most vicious of cold-blooded creatures; moreover, the knifelike edges of the jaws of large individuals are formidable weapons, capable of badly lacerating a man's fingers, or possibly severing a finger if seized at the joint. The turtle darts at the offending object with the rapidity of the serpent's stroke. This vicious nature has elicited for the animal, in many parts of the South, the title of 'soft-shelled snapping turtle.'"

All of the soft-shelled turtles inhabit rivers, ponds, and lakes with a soft, muddy bottom. They seldom or never leave the water unless to deposit their eggs — a short distance above the waterside. In the areas inhabited by these turtles in the United States, they are commonly called the flapjack turtles.



SOUTHERN SOFT-SHELLED TURTLE (*Trionyx ferox*)

In the rivers of Florida this species attains a weight of thirty pounds. A big specimen is dangerous to handle.

Courtesy of Field Museum of Natural History, Chicago.

AMERICAN ALLIGATOR WITH ITS NEST

THE ALLIGATOR

ON THE BANKS OF THE ST. JOHNS

I WAS sailing down the St. Johns River in Florida one beautiful autumnal afternoon when off on a sunny bank at a curve in the stream I spied my first wild alligator. I was breathless with excitement as the flat-bottomed little steamer paddled down upon the sleeping reptile, and stood leaning far over the upper rail, when *crack!* and I almost jumped overboard at the bang of a rifle close to my ear!

The picture was spoiled. My first alligator flopped into the river and sank—not wounded, I am sure; but only because of the poor marksmanship of the gunner!

That is the story of all wild life. To see it is to fire at it—to kill if possible. I saw others, on a long tramp up the Savannah River, but that was twenty years ago. I wonder if a single "'gator" can now be seen on the trip from Augusta to Savannah by cotton boat, or from Jacksonville to Sanford on the St. Johns!

"In its native state," says Mr. Ditmars, "the alligator is a very voracious creature, though it evinces great timidity toward man. However, when cornered it fights with great energy. This is the case if it is caught away from the water and prevented from seeking its escape in the element in which it is so agile and at ease. The tail and jaws of an alligator seven or eight feet in length are formidable weapons and are usually put into simultaneous action. Unable to turn the head, to any extent, upon the short, thick neck, the reptile bends its entire body, in bowlike fashion, reaching sideways at an enemy, this motion bringing the tail around toward the head and with force enough to knock a man from his feet and sweep him in the direction of the infuriated brute's crushing powers. The jaws possess great strength, and, armed as they are with large and numerous teeth, could crush the bones of a man's arm or leg without difficulty. In snapping at an object that has greatly provoked its anger, the jaws of a large alligator will often come together with a deep, booming

Courtesy, Field Museum.

CROCODILES IN HONDURAS

sound, not unlike the striking of a bass drum.

"If discovered in its basking place and escape is not cut off, the wild alligator will always rush for the water in clumsy fashion, plunge in and dive out of sight. So great is this reptile's fear of man that no matter what may be the size of the saurian, from a twelve-inch 'barker' up to a twelve-foot bull that shakes the night air of the lagoons with his bellowings, the same shyness is to be noted. A man may with perfect safety go bathing in waters inhabited by alligators and feel assured that his presence has inspired the reptiles to place a substantial distance between him and themselves.

"The food of the alligator consists of fish, mammals, and birds. The younger individuals feed largely upon the former, together with frogs, tadpoles, and insects."

By a peculiar valve in the throat the alligator can open its mouth and chew under water without strangling: but he must come above the surface to swallow.

Another, stranger habit of the alligator is his bellowing at night. The old twelve-foot males give vent to a thundering, rumbling, bog-quaking bellow, like the sound of pawing bulls, and as they roar, the scent glands — on the under surface of the chin — are opened, ejecting fine jets of powerful musk that fill all the steaming air of the bayou and are carried across the low swamp for miles.

The alligator lays her eggs (twenty-five to seventy-five of them) in nests along the edge of the Southern bayous, where there is fish in abundance and where the reeking swamp heat does all that heat and moisture can to quicken the incubation and growth of the young saurians.

THE AMERICAN CROCODILE

The crocodile is closely related to the alligator but has a narrower head and more pointed snout, also a slightly different arrangement of teeth. The common belief that crocodiles are found only in the Old World and alligators only in the New World is not strictly correct. A true alligator is found in the rivers of China and several species of true crocodiles are found in South and Central America, the West Indies and Mexico.

LIZARDS

MY LITTLE JERSEY FRIEND

NO, I am not going to linger long here over the lizards, in spite of the fact that we have in North America eleven families and ninety-seven species of them! Yet right off I am tempted to devote a whole chapter to my little friend of the Jersey rail fences, the pine-tree swift, *Sceloporus undulatus*. Instead I will ask you to read a whole chapter that I wrote about him and published years ago in my book, "Wild Life near Home."

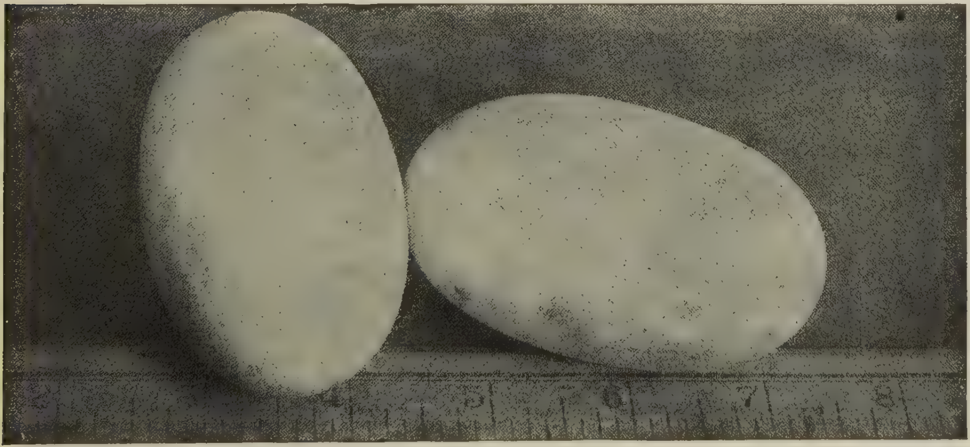
There are about thirty-five species of swifts in America, most of them Mexican and Central American forms, but there are several in the United States, the little pine-tree or fence swift (*undulatus*) being most widely distributed of all. Last summer I caught him on the rocks in the sagebrush deserts of Oregon.

A short account of this little swift will do for the entire family and at the same time give you a notion of the pleasure to be had from such study.

"Throughout southern New Jersey the pine-tree swifts abound. The worm fences, rail piles, bridges, stone heaps, and, above all, the pine trees are alive with them. They are the true children of the pines, looking so like a very part of the trees that it seems they must have been made by snipping off the pitch pines' scaly twigs and giving legs to them. They are the aborigines, the primitive people of the barrens; and it is to the lean, sandy barrens you must go if you would see the swifts at home. In these wide, silent wastes, where there are miles of scrub pine without a clearing, where the blue, hazy air is laden with the odor of resin, where the soft glooms are mingled with softer, shier lights, the swifts seem what they actually are — creatures of another, earlier world. When one darts over your boot and scurries up a tree to watch you, it is easy to imagine other antediluvian shapes moving in the deeper shadows beyond. How they rustle the leaves and scratch the rough pine bark! They hurry from under your feet and peek around the tree trunks into your face, their nails and scales scraping, while they themselves remain almost invisible on the deep browns of the pines,

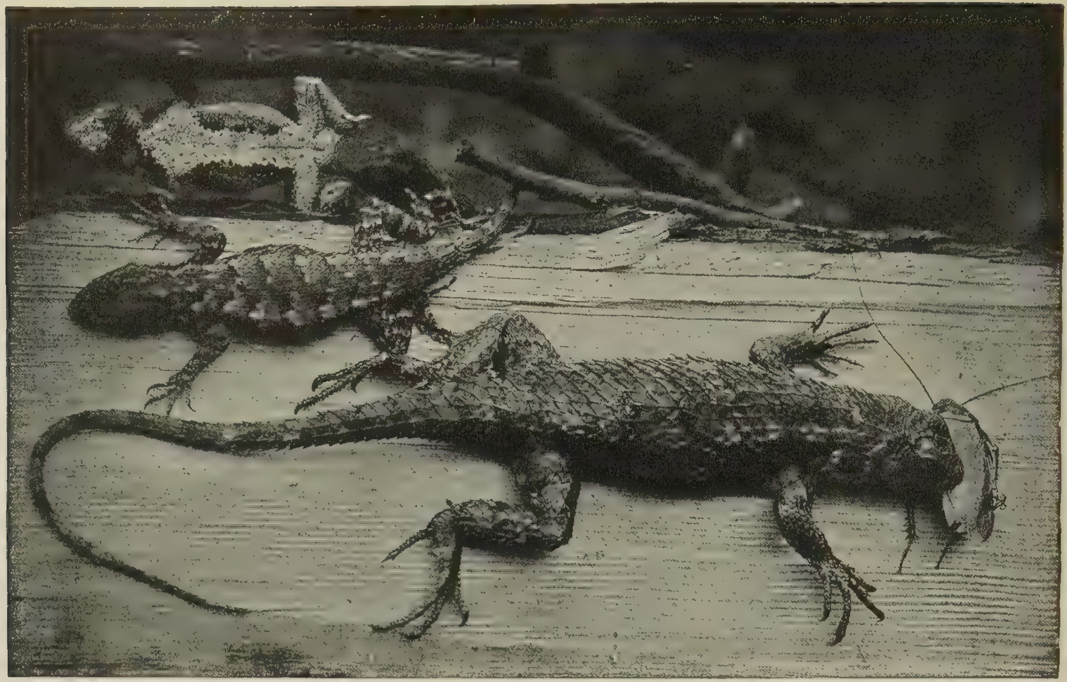
THE HOME OF THE ALLIGATOR

An inlet of the Savannah River, Hampton County, South Carolina. Not a good "swimming hole" for a boy; but what a pool for 'gators!



EGGS OF THE ALLIGATOR

The nest consists of a mound of dead leaves and twigs. It is about eight feet in diameter and two or three feet high. The eggs are well buried, closely packed, and range from three to five dozen.



COMMON SWIFT OR FENCE LIZARD (*Sceloporus undulatus*). NATURAL SIZE

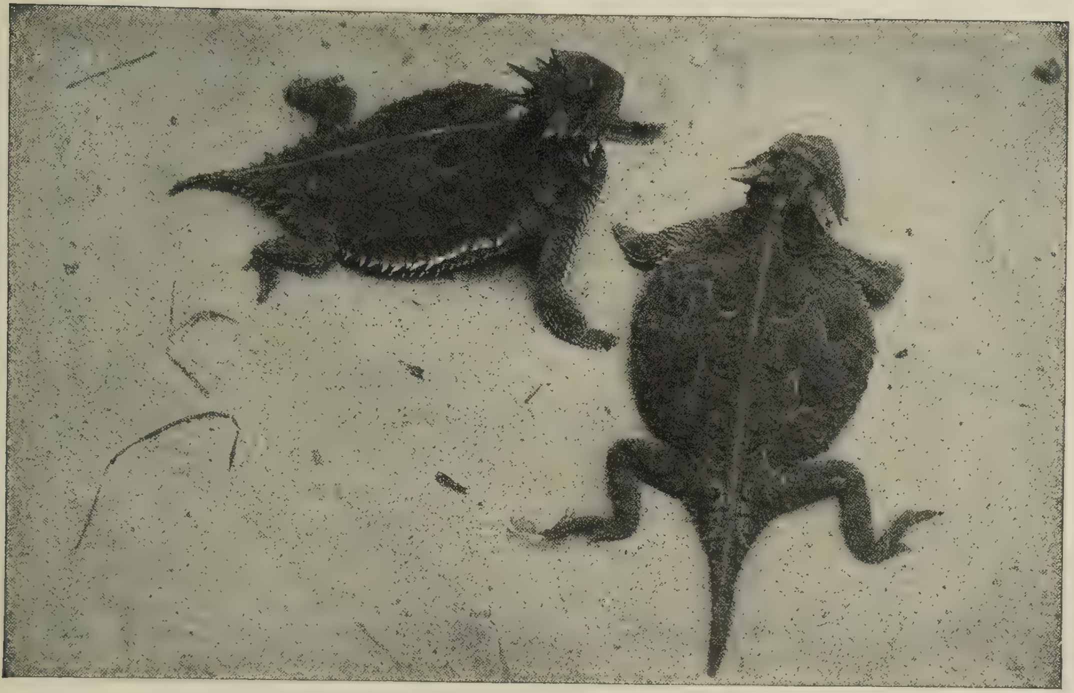
This species lives mostly on the trunks of fallen trees, scurrying about in search of insect prey. On the throat and abdomen of the males are brilliant blue patches.

and if you are inclined to be at all nervous, you will start and shiver.

"The swift is absolutely harmless. He is without fang, sting, or evil charm. He is not exactly orthodox, for he has a third eye, scientists tell us; but that eye is entirely hidden. It cannot bind you fast like the eye of Medusa. Otherwise the swift is a perfectly normal little creature, about six inches long from tip to tip, quick of foot, scaly, friendly, wonderfully colored in undulating browns and blues, and looking, on the whole, like a pretty little Noah's Ark alligator.

"On the south side of the clump of pines beyond Cubby Hollow is a pile of decaying rails where I have watched the swifts, and they me, for so many seasons that I fancy they know me. Dewberry vines and Virginia creepers clamber over the pile, and at one end, flaming all through July, burns a splendid bush of butterfly weed. The orange-red blossoms shine like a beacon against the dark of the pines, and lure a constant stream of insect visitors, who make living for the swifts of this particular place rich and easy while the attraction lasts. Any hot day I can find several swifts here, and they are so tame that I can tickle them all off to sleep without the slightest trouble. They will look up quickly as I approach, fearless but alert, with head tilted and eyes snapping; but not one stirs. With a long spear of Indian grass I reach out gently and stroke the nearest one. Shut go his eyes; down drops his head; he sleeps — at least he pretends to. This is my peace greeting. Now I may sit down, and life upon the rail pile will go normally on. A spider crawls over the rail behind him. He turns and snaps it up. A fly buzzes about his head, but he will not jump with all four feet, and so loses it. A humming bird is fanning the butterfly weed, and he looks on with interest not unmixed with fear. Now the bugs, butterflies, hornets, and wasps make up the motley crowd of visitants to his garden, and Sceloporus stretches out in the warmth again.

"About a hundred feet into the melon patch, which lies along his fence, stands an old and very terrible scarecrow. It is quite without terrors for



TEXAS HORNED LIZARD OR "TOAD" (*Phrynosoma cornutum*)

Commonest and most widely distributed of horned lizards. Found from Missouri to Texas and westward to California.

the swifts, however. Around this monster's feet the soil is bare and open to the sun. One day I discovered a lizard making her way thither, and I followed. She did not stop for ants or spiders, but whisked under the vines and hastened on as if bound on some urgent business. And so she was. When she reached the warm, open sand at the scarecrow's feet, she dug out a little hollow and, to my utter amazement, deposited therein seven tough, yellowish, pealike eggs, covered them with sand, and raced back to the rail pile. That was all. Her maternal duties were done, her cares over. She had been a faithful mother to the last degree,— even to the covering up of her eggs,— and now she left them to the kindly skies. About the middle of July they hatched, and, in finding their way to the rail pile, they stopped at the first mound on the road and began life in earnest upon a fiery dinner of red ants.

"The swifts are remarkably docile and friendly. If treated kindly they will allow you to stroke them and handle them freely within a few minutes after capture. I have sometimes had them cling to my coat of their own will as I tramped about the woods. They hiss and open their mouths when first taken; but their teeth could not prick one's skin if they did strike. They are clean, pretty, interesting pets to have about the house and yard. They are easily tamed, and in spite of their agility they are no trouble at all to capture. I have often caught them with my unaided hand; but an almost sure way is to take a long culm of green grass, strip off the plume, and make a snood of the wirelike end. A swift is sunning himself upon a rail. He rises upon his front legs, as you approach, to watch you. Carefully now! Don't try to get too near. You can just reach him. Now your snood is slipping over his nose; it tickles him, he enjoys it and shuts his eyes. The grass loop is about his neck; he discovers it, and — pull! for he leaps. If the snood does not break you have him dangling in the air. Bring him to your coat now, and touch him lightly till his fear is dispelled; then loose him, and he will stay with you for hours."[1]

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[1] By permission of The Century Company.

REEF GECKO (*Sphærodactylus notatus*)

The only true gecko found in the United States. Occurs near Key West, Florida.

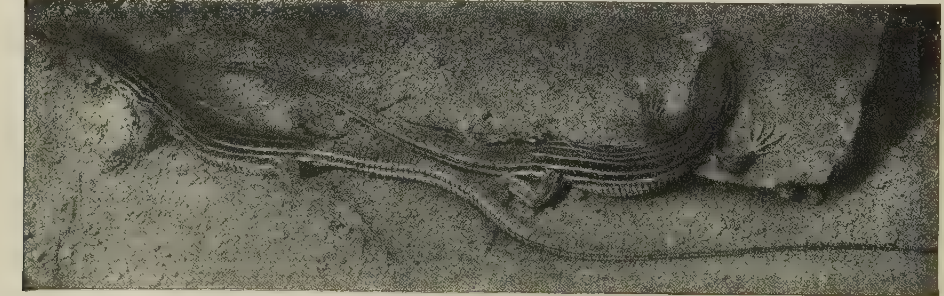
THE GECKO

AMONG the lizards of the United States are the little *reef* gecko found near Key West, Florida, the banded gecko of Texas, the desert iguana of Arizona and California, and the very common little chameleon of our southern swamps. In the deserts of the southwest are found the poisonous Gila monster—the only other poisonous lizard is the Horrid Heloderm of Mexico—and the dangerous-looking but entirely harmless horned toad.

The gecko is an Old World form and abounds in India and Asia, especially in the countries about the Mediterranean, and is quite a domestic animal.

HABITS

"With the exception of a certain number of species, the geckoes are nocturnal in their habits, and many are remarkable for uttering shrill cries, probably produced by striking the tongue against the palate, which in some cases are compared to the syllables *yecko*, *checko*, or *toki*, and in others to the monosyllable *tok*. A South African sand gecko is at times stated to occur in such numbers, and to produce such a din by its cry, as to render a sojourn in the neighborhood well-nigh insupportable. As regards their habitat, geckoes are very variable, some frequenting arid deserts where they, in some instances, burrow in the sand; others frequent wooded regions, living either among low bushes or on trees, and concealing themselves during the day beneath stones or the bark of the stems; others again are found among rocks; while a third group has elected to live among human dwellings, where some of its members have become as fearless and confiding as domesticated animals.



SIX-LINED LIZARD OR RACE RUNNER (*Cnemidophorus sexlineatus*)

The smallest species of a genus remarkable for the activity of its members. The present species retains the striped pattern through life.

"The species frequenting houses may be divided into those which resort to the interior, and those which are content with the outside. Of the latter, Sir J. E. Tennent writes that in Ceylon, 'as soon as evening arrives, geckoes are to be seen in every house in keen and crafty pursuit of their prey; emerging from the chinks and recesses where they conceal themselves during the day, to search for insects that then retire to settle for the night. In a boudoir, where the ladies of my family spend their evenings, one of these familiar and amusing little creatures had its hiding place behind a gilt picture frame. Punctually as the candles were lighted, it made its appearance on the wall to be fed with its accustomed crumbs, and, if neglected, it reiterated its sharp, quick call of *Chic, chic, chit,* till attended to.'"

OUR AMERICAN CHAMELEON

Our American chameleon is not a chameleon proper, for that extraordinary creature, with its opposable claws, its extensive tongue, and amazing eye, belongs to a family all by itself. Our chameleon is so named, however, because it has the peculiar power to change its color — at will, apparently — with as great rapidity and through as strikingly different shades as the chameleon proper. I have seen a bronze anolis (its name is *Anolis carolinensis*) crawl up a bronze-green stem, walk out on a yellow autumn leaf and turn as yellow as the leaf. Instantly the leaf broke off and fell with the chameleon, and when he crawled out of the brown mud beneath he was as brown as the mud — all in five minutes at the most.

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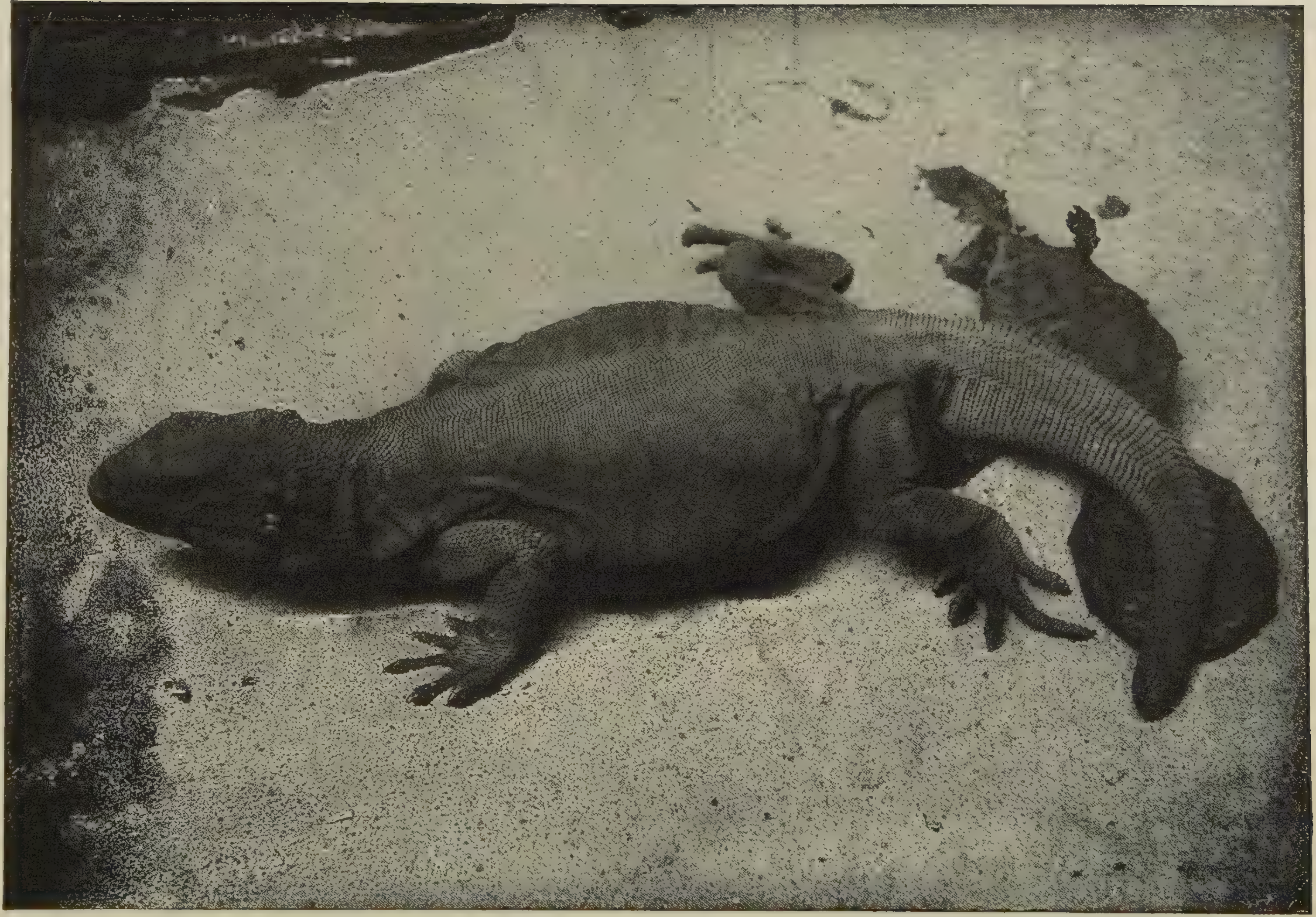
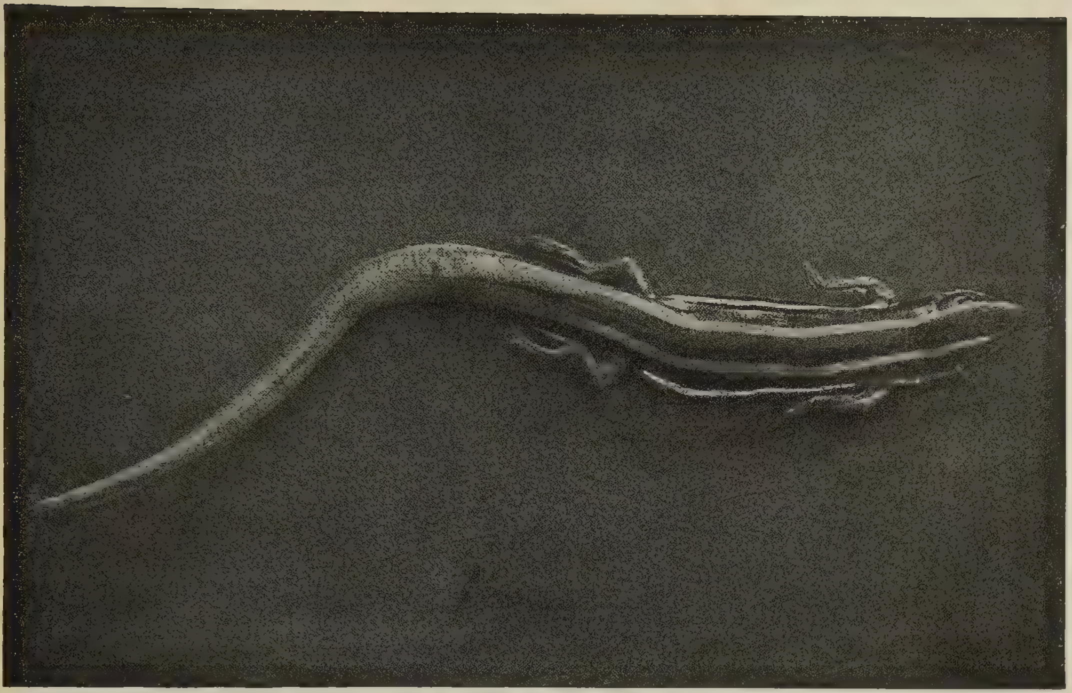
CHAMELEON OF ZANZIBAR

HOW IS THE COLOR CHANGE DONE?

"In describing these color changes it is appropriate," says Mr. Ditmars, "to correct a widespread and incorrect idea; this is to the effect that the change of color is influenced by the shade of the object on which the reptile rests. There is no relationship or influence between the lizard's colors and its surroundings. A brilliant green individual may often be seen resting upon a weather-stained fence rail, or a dark-brown specimen hopping from one green

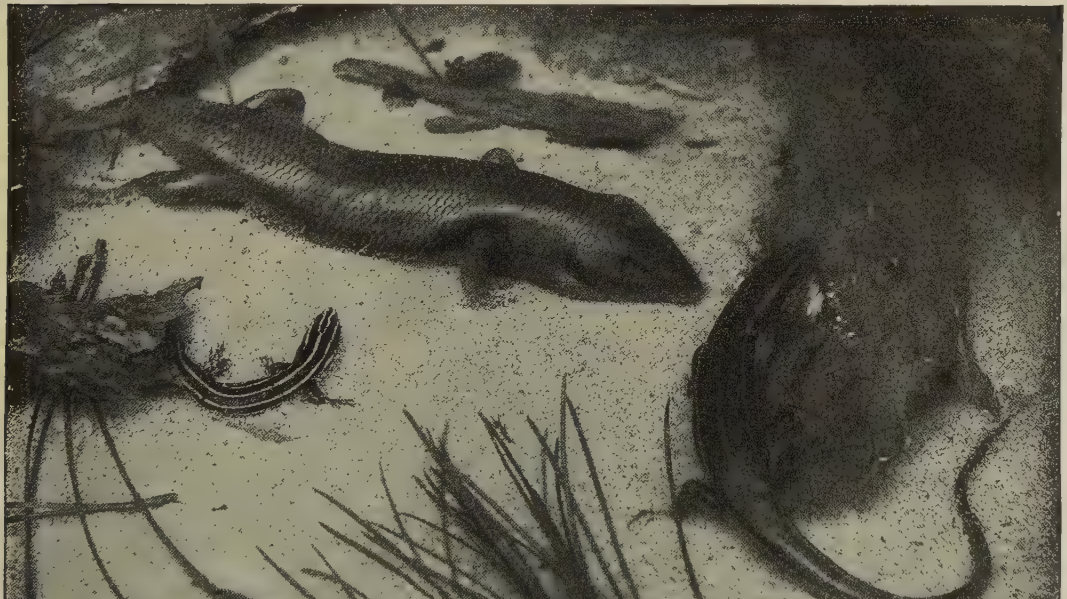


ALDERMAN LIZARD OR CHUCKWALLA (*Sauromalus ater*)



SKILTON'S SKINK (*Eumeces skiltonianus*)

A distinct and handsome species of the Western states. The tail is brilliant blue.



FIVE-LINED SKINK; "SCORPION" (*Eumeces quinquelineatus*)

Young examples are black, striped with yellow, and have a brilliant blue tail. The adults, one of which appears in the middle of the picture, become brownish, with a fiery red head. Until a comparatively recent time the young and adult phases were regarded as distinct species.

leaf to another. The writer remembers an enterprising dealer who exhibited a number of these reptiles in a glass-fronted cage; the back of the cage was divided into four squares of vivid color — yellow, red, green, and blue. Continually annoyed by curious observers, the lizards showed the brightest shades of green, but inconsistent with the dealer's idea, for they huddled together on the square of vermilion which was situated in the most secluded corner of the case.

"The change of color is brought about principally through temperature and light and their influences on the creature's activity; also by anger, fear, and sleep. The most repeatedly observed color is the green of the sleeping reptiles. When poorly fed and in an enervated condition, the skin shows dark spots and blotches. At death, the body is usually green, with scattered patches of black."

A WORD OF MERCY

"Pets" often live a most miserable existence. If one takes home a lizard from the woods, one ought to study its wants as he would those of any other helpless thing depending for its very life upon him.

"In captivity the 'chameleon' makes a pretty pet, soon learning to take food from one's fingers. Mealworms and flies are the favorite food; it will also take roaches. The sugar-and-water diet so often imposed upon these reptiles by kindly intentioned but misinformed people is only taken by the lizard to quench a killing thirst, for these little animals drink much and if deprived of water will rapidly weaken and die. Their method of drinking is to lap the drops of dew from vegetation. The quarters of captive lizards should be sprinkled daily, that the reptiles may drink in this manner; they do not readily find a dish of water."

THE IGUANAS

If one is really fond of lizards he should take up his home in Lower California, for this long peninsula running into the tepid seas seems the very paradise of these scaly creatures. Here dwell the cape iguana, the black and the desert iguanas, the great "chuckwalla," and many others. Indeed, the richest lizard lands in the world seem to be the hot, arid deserts in the extreme southwestern portion of our country.

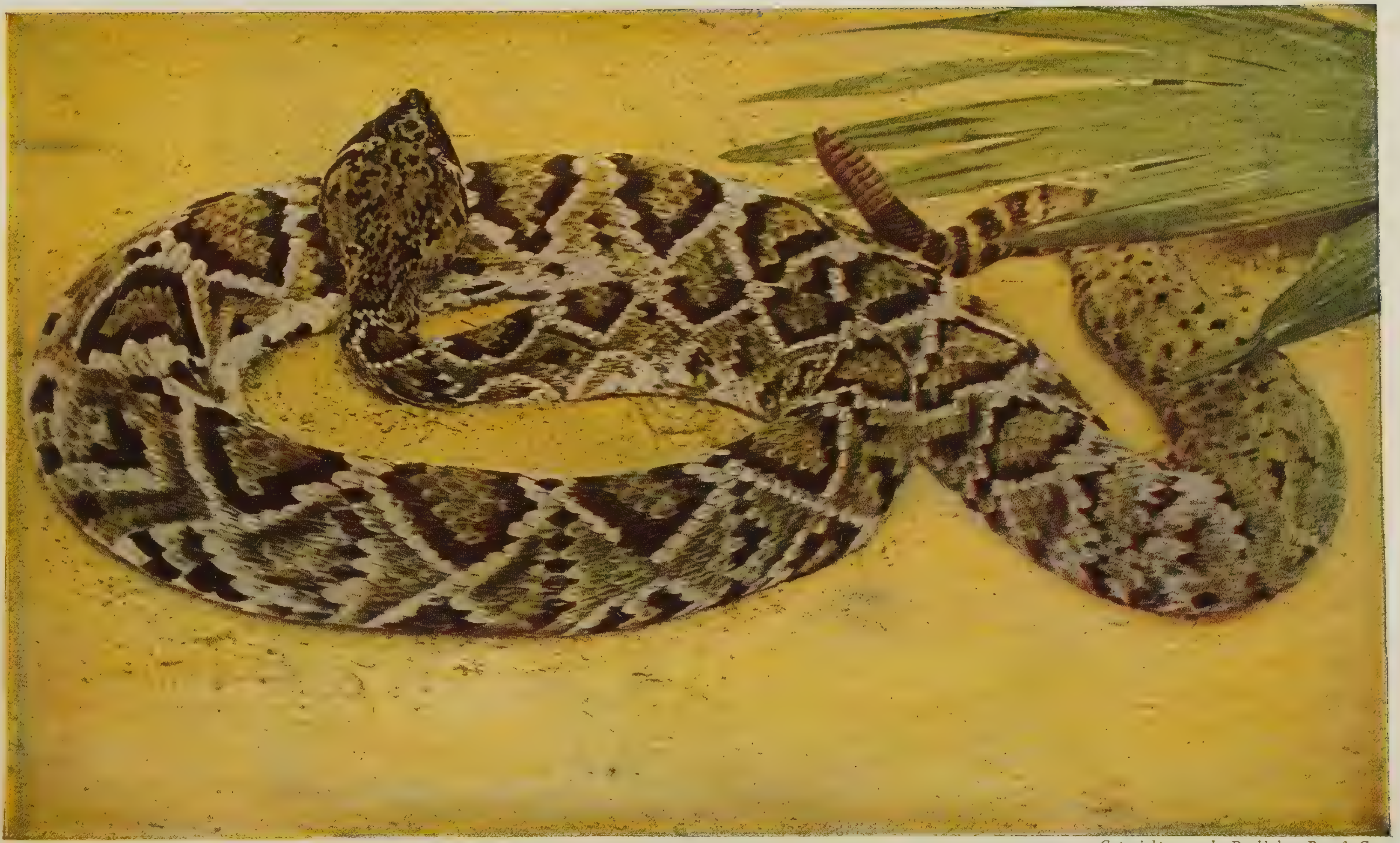
An array of the shapes, colors, and markings of the lizards of this region, varying as they do from the tiny, elongated swifts to the thick, clumsy, beaded body of the Gila monster (pronounced "heela"), is simply bewildering.

But let us get back for a final word about our more common forms. In Delaware you will find a very small lightninglike "racer" called the six-lined lizard or "race runner," that darts under your feet leaving only a streak to be looked at.

Besides there is the large family of skink or "ground" lizards, of which the blue-tailed or Skilton's skink of the Western states is a type. These are known as the smooth-scaled lizards.

These, with the horned toads of the Far West and the legless "glass snakes" of the South, make up an order of creatures not often reckoned with by Nature writers and lovers of the out-of-doors, which will repay study and take an interesting place in one's tramps afield as soon as they are known and looked for.

ONE OF THE EGG-LAYING LIZARDS (*Heloderma suspectum*)



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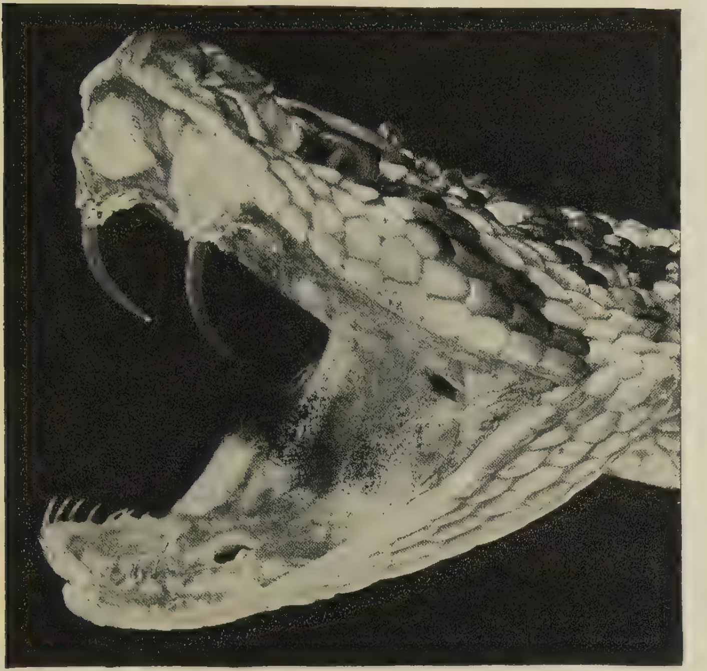
DIAMOND RATTLESNAKE



HEAD OF A RATTLESNAKE

When the jaws are closed the fangs fold back against the roof of the mouth. They are exactly like the hypodermic needle — having an elongated orifice at their tip for the ejection of venom. The opening near the front of the lower jaw shows the location of the tongue sheath. Thus it should be understood that the forked tongue is not a sting or in any way connected with the poison apparatus.

SNAKES

EVERY girl reader of this title will shiver; so will a few of the boy readers, and even their fathers too. Age and sense do not seem to make much difference in our feeling for snakes, a feeling that is not all the result of false education and silly alarm. Say what you will, there is some inherited dread of snakes. I am as well educated in snake ways as one needs to be, but I shiver in spite of myself when a long, sinuous black snake whips from under my feet and darts through the grass.

FEAR OF SNAKES INSTINCTIVE

It is not because I am afraid. When I take hold of the handles of an electric machine I am not afraid, but a shiver runs through every nerve in my body just the same. So, at the sight of a white-throated racer, a shiver runs up and down my nerves, just as if I might be a monkey and the big black racer a python ready to make a meal of me. If in the ages gone my ancestors were of the monkey tribe, as some scientists would have me believe, then I know my instinctive fears and shivers come to me from experiences with pythons and boa constrictors in that dim ancestral past. Or, more directly perhaps, these fears have been passed down to me from the ancient time when my forefathers were tree and cave men and their greatest enemy was found in huge snakes.

OUR SNAKE FEARS ARE FOOLISH

But these tremors are largely foolish and without any bottom. No, not quite without bottom, for as you look at the fangs at the beginning of this chapter you know that they are full of death — quick, terrible death, and that is quite enough to account for the cold chills that run over you at sight of a harmless snake.

For most of our snakes *are* harmless. In New England, for instance, the only venomous snake is the banded or timber rattler, *Crotalus horridus*, and this one is comparatively rare, being confined now almost wholly to the mountains and rocky hills.

From my study window, however, I can look away fifteen miles as the crow flies to the Blue Hills, on whose rocky slopes there are many rattlers' dens — not so large as some of those to be found among the rocks of Sullivan County in New York State — but deep and wild enough to protect the snakes against the warfare of civilization which has been waged upon them since Boston town was settled.

Farther south from New York State down we have another deadly snake, the copperhead, or highland moccasin — a slow, logy serpent about four feet in length, that likes low, rocky, timbered ground, and whose fangs are even more deadly than the rattlesnake's.

Still farther south we have another deadly reptile in addition to the rattlesnake and copperhead — the vicious water moccasin or "cotton mouth." There are several species of rattlesnakes (thirteen of them), and all but three of them inhabit the southwestern portion of our country. In our eastern Southern states is found the largest — the diamond-backed rattler — and the smallest of the family in the United States — the little sand rattler or pygmy rattlesnake, rarely more than seventeen inches long.

I have come upon this ugly little beast in the sands of Georgia, where out of a tiny sand pit at my very feet has sprung his rattle, sending me into the air with a jump of terror. For while it *might* not kill me, still deaths have occurred from it, and no one can resist his impulse to jump at the warning. Dr. C. Glover Allen thus describes his experience after a bite from the pygmy:

"I was placing the snake in a bag, holding the reptile by the neck, when my forefinger slipped and the little creature took instant advantage by turning and burying both fangs in my thumb. I was so used to handling the big 'diamond-backs' that the bite did not greatly alarm me. Taking an elastic band, I at once applied this as a ligature at the base of the thumb and then opened both fang punctures with a razor, to a greater depth than the teeth had actually gone. I alternately sucked and washed out the wound, applied a solution of permanganate of potash, and finally applied a wet, antiseptic bandage. Then I removed the ligature. The thumb throbbed painfully, as did the wrist, and a portion of my hand was badly swelled, but a day or two afterwards these local symptoms passed away. I attributed my escape from more serious consequences to the almost immediate scarification, application of the ligature, and washing of the wound."

THE DIAMOND-BACKED RATTLER

The picture given on page 283 is that of the great diamond rattler, and I think it forms as terrible a face to meet in a Southern swamp as could be seen. I came upon one in the great swamp on the west bank of the Savannah River, as large around as my arm and seven feet long — a monster!

HABITS OF THE DIAMOND-BACKED RATTLESNAKE

Mr. Ditmars says of the diamond rattler: "Most deadly of the North American poisonous snakes and ranking in size with the largest of the tropical venomous serpents of both the New and the Old World, this huge rattlesnake, with its brilliant and symmetrical markings, is a beautiful and a terrible creature. Ever bold and alert, ever retaining its wild nature when captive, there is a certain awe-inspiring grandeur about the coil of this formidable brute; the glittering black eyes, the slowly waving tongue, and the incessant, rasping note of the rattle. All dignity, the 'diamond-back' scorns to flee when surprised. His neighbor, the cane-brake rattler, may retreat in good order, rattling as he goes, but retreating nevertheless; with this pirate of the hummocks, it is different. The mere vibration of a step throws the creature upon guard. Taking a deep inhalation, the snake inflates the rough, scaly body to the tune of a low, rushing sound of air. Shifting the coils to uncover the rattle, this is 'sprung' with the abruptness of an electric bell. There is no hysterical striking, but careful watching, and if the opportunity to effect a blow with the long fangs is presented, the result is generally mortal.

"If outstretched, when surprised, the snake invariably throws the body into a *symmetrical* coil, doubling the neck into an S-shaped loop with the head drawn well back and within the circle of the body. Various rattlesnakes of the West, the copperhead snake, and the moccasin will strike from various positions and often aim blows while crawling, but the diamond-back persists in its perfectly round and graceful coil, while on the defensive. To observe a large specimen taken unawares and literally fling itself into fighting position, is to see determination and courage that exist among few reptiles.

"It is not necessary for these snakes to see a human form to display annoyance. So sensitive are they to vibration that a footfall starts their rattles, which continue buzzing for some time, then gradually settle to a monotonous chick-chick—chick-chick—chick-chick—chick — chick — chick — and cease to sound. Morose and hostile lie these sullen coils, for month after month.

"Pine swamps and hammock lands are the abode of the diamond rattler. In the South Carolina low grounds we found that these reptiles displayed the habit of hiding under the broad leaves of the dwarf palmettos during the day, and issuing for their food at twilight. So closely do the body colors blend with the vegetation and the effect of sunlight and shadow, that the coiled snake is seen with difficulty. The writer was shown the large, hollow stump of a tree on the edge of a pine swamp, in South Carolina. From this hiding place a big rattlesnake had several times been seen to emerge and glide into the growth of the swamp. Rabbits were common in the vicinity, and these animals appear to form a large percentage of the snake's food. While some weeks were spent collecting in this vicinity, but two rattlesnakes were taken, although their tracks across the sandy roads were frequently seen, demonstrating their prowlings to be always at night."

While collecting specimens and studying the wild life of the great Savannah River swamp, I found several of these deadly rattlers and always took the opportunity to keep well out of striking distance, for I never saw one that would budge a peg for me.

HOW THE GREAT DIAMOND RATTLER EATS

If one has never seen a snake eat, the process might fascinate him, but it would also fill him with terror. I have had many tamed snakes, and have watched their feeding a hundred times. But Mr. Ditmars has seen the great diamond rattler feed and thus describes the act:

"A medium-sized rabbit is placed in the cage, and the snake at once shifts its coils to a striking posture. The rabbit betrays no signs of fear and may hop toward the reptile, which warily draws back its head. While nosing about the rabbit momentarily presents its side to the snake, and like a flash of light the deed is done.

"The human eye can observe but two things. First, the snake appeared to strike for the rabbit, and secondly, to have barely touched it with its jaws; but during that blurred movement several things have happened, thus: The snake struck for the rabbit with opening jaws; when its head reached the prey its jaws were very wide apart and the fangs raised to such an extent that they were cast directly forward; the fangs pierced the rabbit; the jaws were closed sufficiently to deeply imbed the fangs; a muscle over each poison gland was contracted and a considerable quantity of venom was injected. Some of these movements were simultaneous.

"But the effect upon the rabbit must be noted. The snake is back in the original position before the rabbit's frightened squeal is over. The little creature bounds forward, rolls on its side, kicks convulsively, and is dead. Barely one minute passes from the time of the serpent's stroke to the termination of the death struggle.

"The snake waits patiently until it is satisfied that the last spark of life has departed, when it uncoils and begins an examination of its prey. Gliding about the rabbit, it places its snout close to the animal's body and probes with the tongue tips into the fur. At last, opening its mouth, the snake seizes its prey by the nose, when the engulfing process begins."

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SNAKE EGGS, WITH YOUNG SNAKES JUST EMERGING

THE PACIFIC RATTLESNAKE

On my table as I write lies the skin of a Pacific rattler. We were traveling over the high sagebrush deserts in southeastern Oregon during a recent summer, and had climbed up and up, from rim-rock plain to rim rock, and were descending a narrow pass looking over into a deep wild gorge.

"Good place for snakes," I said, and we stopped, and got down to the shelves where the rats and wild mice had their runways to the bottom of the cut. I had hardly touched the floor of the gorge when the dry, shivering whir of a rattler brought me to a quick halt. Here he lies on my table, his rattle no drier for all its year of hanging on the wall, but no longer able to send the shivers tingling through my body.

He was lying under an overhanging shelf in what was his den, a big, thick, ugly creature that coiled himself into an S hook till head and tail almost met, as I got down on my hands and knees near him. No, I did not enter his cave. After I had angered him into "striking" one of the men, a collector shot him for me and prepared me his skin.

QUESTION — WHAT IS THE RATTLE FOR?

Here is a question for you. But be careful how you handle your subject. There is no safe end to a rattlesnake, even when the fangs are drawn, for turning back to the picture of the head and fangs at the beginning of this chapter you will see that behind the old fangs new ones are already developed ready to take the place of those in use, should anything happen to them. Many a person has lost his life by not knowing that snakes have, not one, but several sets of *uncut* fangs against possible accident and need.

But what is the rattle for? I don't know. To warn people? What has the moccasin to warn his enemies with? There are many deadly snakes in the world, but our rattlesnakes are the only ones with this peculiar appendage at the end of the tail.

HOW THE RATTLE GROWS

It is interesting to know that "when the young rattlesnake is born, it is provided with a soft button on the tip of the tail, which, though vigorously shaken in imitation of the parent's rattle, produces no sound, as it is rigidly attached to the tail. Within a few days after birth the young rattlesnake sheds its skin and commences feeding, taking small mice or other young rodents. It grows rapidly and in about two months sheds the second skin, when the first *ring* or segment of the rattle is uncovered. This has been steadily developing under the old epidermis, and at such times its presence was apparent in the swelled appearance at the base of the original button. Immediately after the shedding of the skin, this ring is black and soft. It loosely incases the base of the button, and, after a few days, when the segment has become thoroughly dry and the tail is shaken, a faint buzzing sound is produced — this caused by the loosely attached button rasping against the dry segment to which it is fastened. Now that the button has become detached from the base of the tail, it becomes a dull straw color — the general hue of the rattle. At this time the snake has a rattle in miniature. Every succeeding segment is produced in exactly this fashion."

SOME OTHER SNAKE QUESTIONS AND NOTIONS

Now, before we take up our common, harmless snakes (and, as we have seen, most of them are harmless), let us dispose of some false notions and foolish prejudices. For we all have them — a very large batch of them where snakes are concerned.

SNAKES DO NOT STING

"For example, it is a popular belief that snakes sting with the tongue. This may be due to the Scriptural expression, 'stingeth like an adder.' The Scripture did not say the stinging is done by the tongue, or is not done by the tooth, and the reader at once infers that the tongue is the stinging organ, and thus falls into a serious error." [1]

One glance at the teeth, the fangs, at the beginning of this chapter will forever dispose of that "sting" notion.

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[1] This and much of the following matter on snakes is quoted by permission from report by Professor H. A. Surface, state zoölogist of Pennsylvania.

A HAUNT OF THE DIAMOND RATTLESNAKE

A road through the hammocks of the South. The big Southern rattlesnake often crossed this road at night. The lagoon on the left teemed with water moccasins. In the immediate vicinity, over three hundred snakes of various species were captured in less than two weeks' time.

"The tongue of the snake is its organ of touch, taste, and perhaps in part also of smell, and possibly even of hearing. It is by this that it investigates the objects immediately around it. When it is seen to stick out its tongue it is making a critical inquiry of the surrounding objects and is not attempting to sting anything.

THEY DO NOT "CHARM"

"It is also popularly believed that snakes have the power to charm birds and the lower animals and even mankind, but with the most careful investigation we cannot find satisfactory evidences of the truth of this. It is true that some creatures, such as birds, and even some persons, become so terrified at suddenly seeing a snake that they act more or less helpless; but this is quite different from being charmed."

But over and over I have seen among the birds what might be called charming — a spell of such terror cast by the sinister head and gliding, coiling body and glittering eye of the snake that the bird drew nearer to the snake in his agonized hopping and crying as the snake drew nearer to its nest.

THE "GREEN" SNAKE NOT POISONOUS

"Another common error is the belief that the green snakes are venomous because they are supposed to be filled with a poison that makes them look green. Of the few species of green snakes to be found commonly, not one is of a dangerous type. If you want a snake pet, choose the little green snake.

THAT OLD HOOP SNAKE!

"The old story of the hoop snake, whch is supposed to take its horned tail in its mouth and roll downhill like a hoop, striking dead anything into which that venomous horn may fly, is very common but entirely without any foundation of truth. No specimen of hoop snake has been collected, notwithstanding an offer of a reward of five hundred dollars for one. Persons who believe such things have not considered that this habit would result in bringing all such reptiles down into the valleys where they must be found, as they would be unable to roll uphill again. Who will say he has seen a hoop snake rolling?

CHOKING AND CHASING

"Another common belief is that the constricting species of serpents wrap themselves around the necks of human beings and choke them. All stories of this kind, so far as we have been able to learn by the most careful investigation, are the results of active imaginations. Even the stories of snakes chasing people are, as a rule, generally exaggerated. It is true that black snakes will sometimes pursue timid persons who have disturbed them. That seems to be one of Nature's bluffs, however, as the same reptiles will turn tail and depart in the most vigorous manner possible when the pursued person has the courage to turn on them. Even if they do chase a person, they will not overtake or attack him.

SNAKES MILKING COWS

"Among the myths must be classed the common belief that snakes milk or suck cows. This feat is not possible, and in our honest opinion never was performed."

I have known one to live in my grandmother's cellar and *drink* her cream from off the pans of milk for weeks before she discovered the long, lazy, fat old thief; but as for milking cows — don't tell that to any snake man!

THE SNAKE'S TAIL AND SUNDOWN!

"How common is the absurd belief that a snake's tail does not die until sundown or until it thunders! When we were at home with the country boys, we firmly believed with them that to kill a snake and turn it upside down would bring rain.

THE STRIKING COIL

"Another erroneous popular belief is that snakes jump or spring from the ground at their victims. No snake is able to jump or spring, but merely strikes from its zigzag coil, which is like the letter S placed horizontally. It can then only reach the distance that it is able to strike out from this double curve, which is rarely more than half the length of its body, and probably never more than three fourths of its total length. No snake springs clear from the ground as it strikes, and none jumps through the air to its victim, although occasionally the blow may be delivered with such force as to turn the reptile over."

SWALLOWING THEIR YOUNG

Another curious belief is that snakes swallow their young for protection. Perhaps they do, but I very much doubt it. I have never seen it. Of course, that does not mean that no one else has ever seen it. But I have so many times seen just what others have seen and called swallowing their young, that I am inclined to believe snakes never do it.

For instance, a great many snakes are oviparous, that is, they lay eggs; a great many others are ovoviviparous, that is, they give birth to living young, the eggs forming and hatching inside the body cavity. Now, as everyone kills snakes, it frequently happens that one is killed when its body is full of its little young ones about to be born. Hence the belief that they swallowed them. But then many snakes devour the young of other snakes, and as they are swallowed alive this may also account for some of the reports.

In an essay called "The Wild Mother" I once wrote for the "Atlantic Monthly," I said, speaking of the mother instinct in wild animals: "I do not know of a single mother among our reptiles. The mother passion, so far as my observation goes, plays no part whatever in reptilian life." In reply to that observation letters have come to me from over the whole country, telling of mother snakes swallowing their young for protection. Here is one from a correspondent, a woman in the South:

MONTEVALLO, ALA.,

MY DEAR SIR:

It surprised me to read in your article, "The Wild Mother," that you had known no instances of mother passion among snakes; for always I have heard that snakes guarded their young most zealously.

Personally I have not either — but then I never stop to study — but my next-door neighbor here, Mr. Lou Campbell, when out hunting last spring heard a most peculiar rustling in the grass near him and saw a huge moccasin. He shot the snake through the middle and saw pieces of little snakes scattered about. Whereupon he cut open the parent or caretaker and found seventeen live, unmutilated moccasins inside the body.

Another man who lives near Randolph in this state saw the snake in act of swallowing. He killed the snake without mutilation, tied up the mouth, brought the body to a doctor in Randolph, whose autopsy before witnesses found — please don't try to believe this — seventy-two young snakes. Whereupon he put the whole kit and bilin' in a big jar in alcohol, where my informant saw them.

That doctor's name is Sum Woolley — and I have heard similar tales all my life.

H. B. H.

To
Dallas Lore Sharp, Esq.,
c/o Atlantic Monthly,
Boston, Mass.

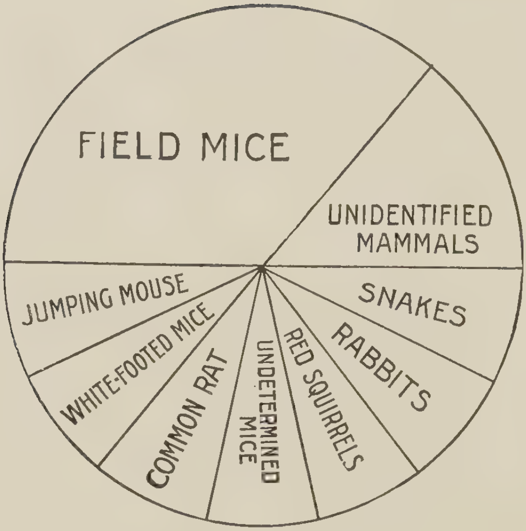
ANOTHER PROBLEM FOR YOU

Now this is a problem for you to solve. You watch. It may be years before you see it; but, among other things that all nature students and observers would be glad to know, is your careful and certain record of this curious and doubtful habit on the part of snakes. (Read the story of the python in the Jardin des Plantes, Paris, "The New Natural History," Vol. V, page 2544.) In the letter just quoted, the *young* moccasins were without question those about to be born.

Among our common snakes that bring forth living young are the garter, the water, and the rattlesnake.

SOME COMMON SNAKES AND PLAIN FACTS

The largest snake family for mere numbers and varieties is our striped or garter snakes — long, slender, striped and spotted snakes of the grass. Nine out of every ten snakes you see in an ordinary walk will be garter snakes. They are perfectly harmless, but as they eat



FOOD ITEMS OF RATTLESNAKE
After H. A. Surface.

frogs, toads, and fish they are not the farmer's friends.

THE HOGNOSE ADDER

The hognose or blowing or puffing or spreading adder is not the friend of the agriculturist either, for he largely feeds on toads, and toads are among the most valuable of our insect destroyers.

Look at its damaging menu! Add the 41½ per cent of toad to the 33 per cent of insects *from toads* and you have 74½ per cent of this creature's diet valuable toad! A bad showing! Compare it with the deadly rattlesnakes and moccasins, on the other hand. These are dangerous in their bite, but what a world of good they do us in their destruction of mice! Count up the possible per cent of mouse in this bill of fare. It is perhaps over 80 per cent mouse or rat.

The snake that I see oftenest about my hillside farm is the adder — the hognose or spreading adder or viper, as you choose to call him. He has all the marks of a poisonous snake, with the spreading hood or neck of the cobra. He has all the show of poison too, but he is a great bluffer, and, if you push your foot at him, he will turn over on his back, eject his dinner (and that is sometimes a *live* toad), and opening his mouth — die! That is, he *looks* dead. But he comes to life again as soon as you go away.

THE WATER SNAKES

West of the Mississippi River we have about eight different species of water snakes, with two others farther west. They are a nasty, disagreeable, ill-natured lot. They always spoil a swim for me when they slip around in the mill pond where I am in bathing.

I have photographs of several of them; but no one who fishes and roams the meadows needs to be told what the water snakes look like — or smell like!

A FEW OTHERS

Among our other interesting serpents should be named the black-and-white-ringed thunder snake, or king snake, or, as we used to call him in New Jersey, "the rattlesnake's pilot" — just why I don't know, for this powerful, beautiful, and gentle creature *eats* rattlesnakes, kills them in its deadly coils.

THE BULL OR PINE SNAKES

The bull or pine snakes probably attain the greatest size of any of the North American harmless snakes. Their large bodies, pointed head, and coloration — yellow or white, with dark, square blotches upon the back, render them readily distinguishable.

Three species inhabit the United States and northern Mexico. These may be classed among the most useful reptiles, as they feed upon small mammals that are injurious to man.

"Owing to one character the bull snakes are quite unique among the North American snakes. This is the presence of a peculiar filament of cartilaginous flesh in the mouth, situated immediately in front of the breathing passage. When the snake is angry, the mouth is partially opened, the filament is raised and the breath expelled violently against it. A very loud, hissing sound is thus produced."[1] We used to call it "crying."

These snakes are great ratters. An old doctor down in New Jersey, not far from my home, had one in his house for years instead of a cat;

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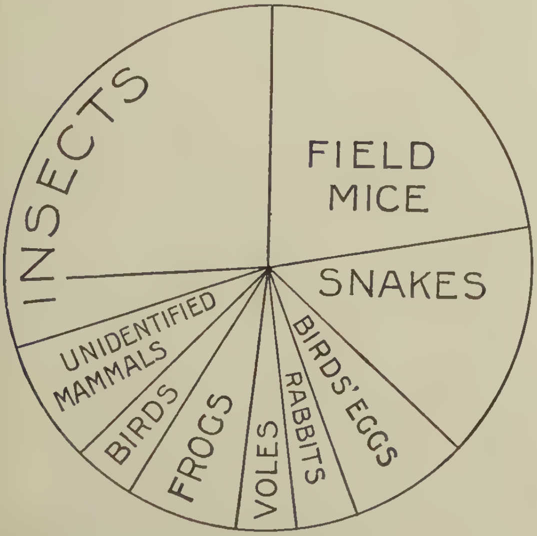
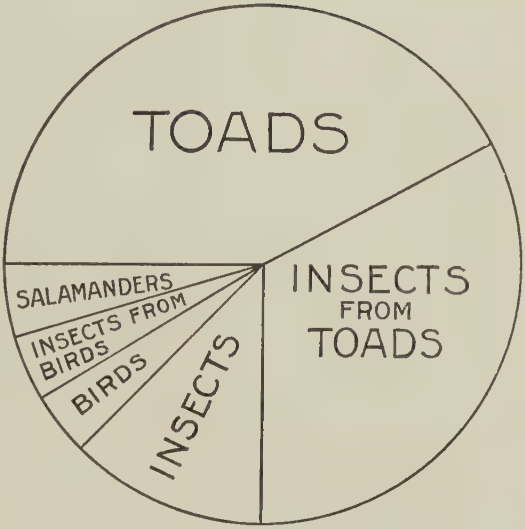
[1] "The Reptile Book."

and I have heard my mother tell how the creature one day caught a rat under the old doctor's secretary and whipped out into the middle of the room with it, scaring her nearly into fits! When I was a boy I was half owner in a big one over six feet long that had a bed upstairs and crept all over the house during the day.

"It is very fond of birds and eggs," says Mr. Ditmars. "In swallowing the latter it goes through an interesting performance. The egg is engulfed entire — without breaking the shell — and swallowed for a distance of about eight or ten inches down the neck, when that portion of the reptile is pressed firmly against the ground, the muscles are called violently into play and exert themselves in such a manner that strong pressure is brought against the egg from anterior and posterior directions. Subjected to this compression the shell is broken and the fragments are swallowed along with the contents of the egg, all parts of which are digested. Many of the mammal and bird-eating snakes feed occasionally upon eggs, but they generally consume them entire and await the action of the gastric juices to dissolve the shell, a condition taking place within the space of two or three days. All the snakes of this genus, however, go through the performance of breaking the shell before swallowing the egg. A pine snake of five feet in length can easily swallow the eggs of a hen, and will consume from four to six at a meal."



FOOD ITEMS OF BLACK SNAKE
After H. A. Surface.



FOOD ITEMS OF SPREADING ADDER
After H. A. Surface.

MOLTING OR SHEDDING, AND COLOR

Professor Surface thus describes the manner in which snakes shed their skins:

"It is often believed that snakes go blind during dog days, and that they are blind once each month at the least, and that molting or casting off the skin occurs each month, etc. There is just enough truth in this belief to keep it in existence. Snakes do molt or cast off the epidermis, or outer skin, which becomes dry or hard and whose owner, if it were not shed or cast off, could not grow. This molting is generally not more than two or three times a year and depends on the rate of growth of the reptile, which in turn depends upon the supply of food. At such times the clear, glassy cuticle which passes over the eye, without an opening, becomes loosened from the eye and assumes a milky appearance. It is then that the snake is temporarily blind, but only for a short time.

"The color of snakes varies greatly even in the same species and depends more upon the stage of molting than upon anything else. The snake which has recently shed its skin has very bright colors, and as it becomes older it becomes darker and duller in appearance. This molting takes place by the outer skin becoming loosened around the lips and turning backward inside out. Sometimes the entire 'skin,' or epidermis, is left whole or unbroken. However, at the tip of the tail, around the eyes, and around the mouth can be seen very plain evidences that it has been turned inside out in the process of shedding. This provides not only for a new coat, but especially for the growth of the former wearer.

HOW SNAKES FEED

"The method of feeding is very peculiar and interesting, as they frequently swallow objects which are much larger around than themselves. They are the only creatures which are able to do this. This possibility is due to their being provided with an extra bone called the quadrate bone, hinging between the upper and lower jaws, which makes it possible for the mouth to open to an extreme extent, while the lower jaw itself will separate at the front edge by spreading sidewise, allowing the jaws to spread open in two directions when necessary. In capturing their prey, some species, known as the constrictors, squeeze it until it is killed and then proceed to swallow it. Others strike their food and hold it, and by an imperceptible movement of the jaws gradually work it around so that they can swallow it lengthwise. Some species of the poisonous reptiles may strike their prey with the poison fangs and thus kill it before eating, but when it is possible they avoid wasting the venom and do not kill their food by poison before eating. It should here be added that the venom of the two species with which I am acquainted, the rattlesnake and the copperhead, is not an internal poison, or is not injurious if taken inwardly (unless an internal scratch should let it into the blood), and its fearful effects occur only when the poison is injected into the blood system.

"Some of the serpents which kill their prey before eating cover it with a slime before swallowing, if it be of large size. We know definitely of snakes covering rabbits with slime before attempting to swallow them. It is probable that only those animals which are covered with hair or feathers, or are very dry, like the toad, are thus treated before they are swallowed.

HOW SNAKES "RUN" OR MOVE

"A serpent literally walks on the ends of its ribs. That is to say, the ribs are jointed to the backbone, and as they extend down over each side of the body their ends are in connection with the ventral plates, which have projecting edges at their rear margins. As these plates hold to the objects beneath the animal, its body is brought forward upon the supporting and movable ribs. In this method of locomotion is to be found the explanation of why snakes cannot run on smooth glass or upon such objects as Brussels carpet. Glass is so smooth that the ventral plates are unable to hold to it, and after they have been thrown forward the animal cannot carry itself along. In attempting to crawl on Brussels carpet, the surface of which is composed of small upright stiff threads, the piling springs backward by the pressure of the ventral plates when the reptile attempts to move itself forward, and it thus fails to find a leverage, just as upon the smooth glass."

SNAKE MAGIC[1]

Years ago, I once went off on a Sunday-school picnic, and sauntering into the woods alone I picked up a dainty little ribbon snake. Having no bag or box along, I rolled him up in my handkerchief and journeyed on with the wiggling reptile safely caged on top of my head under a tight-fitting hat.

After a time I began to feel a peculiar movement under the hat, not exactly the crawling of a normal snake, but more like that of a snake with legs. Those were the days when all my soul was bent on the discovery of a new species — of anything; when the whole of life meant a journey to the Academy of Natural Sciences in Philadelphia with something to be named. For just an instant flashed the hope that I had found an uncursed snake, one of the original ones that went on legs. I reached for the hat, bent over, and pulled it off, and lo! not a walking snake — just an ordinary snake, but with it a live wood frog!

This, at least, was interesting, the only real piece of magic I have ever done. Into my hat had gone only a live snake, now I brought forth

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[1] From "Wild Life near Home."

COMMON BULL SNAKE (*Pituophis sayi*)

This snake, one of the largest of North American serpents, is of economic value, as it preys largely upon rodents. It is found in the Plains region and the West.

the snake and a live frog. This was a snake to conjure with; so I tied him up again and finally got him home.

The next Sunday the minister preached a temperance sermon, in which he said some dreadful things about snakes. The creatures do seem in some dark, horrible way to lurk in the dregs of strong drink; but the minister was not discriminating; he was too fierce and sweeping, saying, among other things, that there was a universal human hatred for snakes and that one of the chief purposes of the human heel was to bruise their scaly heads.

It happens that I inherited from my mother a strong dislike for sweeping, general statements. After the sermon I ventured to tell the preacher that there was an exception to this "universal" rule; that all snakes were not adders and serpents, but some were just innocent snakes; and I asked him out to see some tame snakes which I had. He promised to walk over in the morning.

As we went from cage to cage, he said he had read how boa constrictors eat, and would n't I show him how these snakes ate?

We had come to the cage of the little ribbon snake from the picnic grove, and had arrived just in time to catch him crawling away out of a hole that he had worked in the rusty mosquito-netting wire of the cover. I caught him, put him back, and placed a brickbat over the hole.

I knew that this snake was hungry, because he had had nothing to eat for nearly a week, and the frog which appeared so mysteriously with him in my hat was the dinner that he had given up that day of his capture in his effort to escape.

The minister looked on without a tremor. I took off the brick that he might see the better. The snake was very long and small around, and the toad which I had given him was very short and big around, so that when it was all over there was a bunch in the middle of the snake about the size of the lump a prime watermelon, if swallowed whole, would make in the middle of a small boy.

While we were still watching, the snake, having comfortably (for a snake) breakfasted, saw the hole uncovered and stuck out his head. We made no move. Slowly, cautiously, with his eye upon us, he glided out, up to the big bunch of breakfast in his middle. This stuck. Frantically he squirmed, whirled, and lashed about, but in vain. He could not pull through. He had eaten too much.

There was just one thing for him to do if he would be free: give up the breakfast of toad (which is much better fare according to snake standards than pottage according to ours), as he had given up the dinner of frog. Would he sell his birthright?

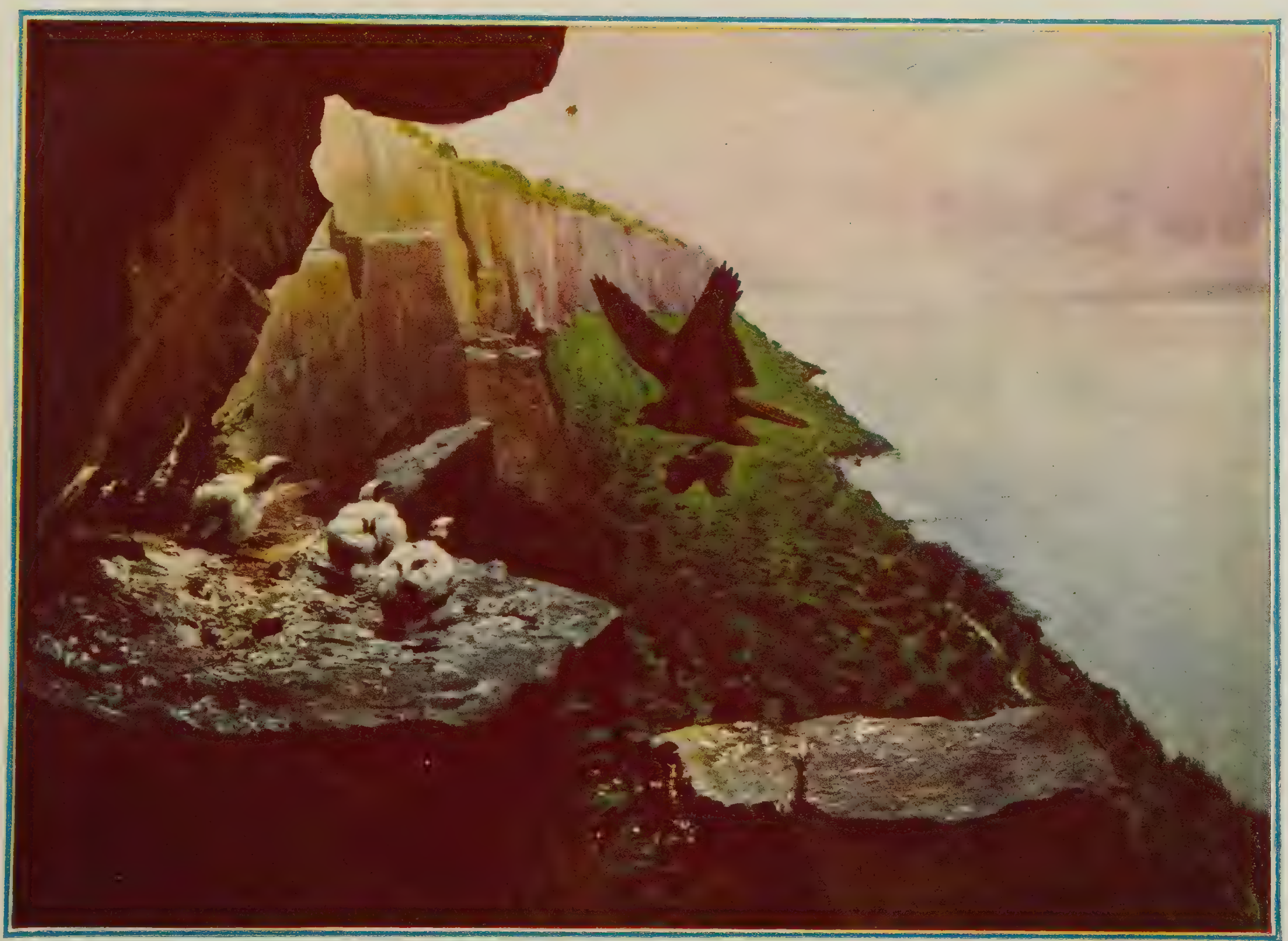
Perhaps a snake cannot calculate; perhaps he knows no conflict of emotions. Yet something very like these processes seemed to go on within the scaly little reptile. He ceased all violent struggle, laid his length upon the netting, and *seemed* to think, to weigh the chances, to count the cost.

Soon he softly drew back into the cage. A series of severe contortions followed; the obstructing bunch began to move forward, up, farther and farther, until at last, dazed, squeezed, and half smothered, but entirely alive and unhurt, the toad appeared and once more opened his eyes to the blessed light.

The snake quickly put his head through the hole, slipped out again, and glided away into his freedom. He had earned it. The toad deserved his liberty, too, and I took him into the strawberry patch.

The minister looked on at it all. Perhaps he did n't learn anything. But I did.

AN OLD MILL IN THE ALLEGHANY MOUNTAINS — A GOOD LOCALITY FOR SNAKES



DUCK HAWK AND YOUNG AT NESTING PLACE

In "The Gorge" on the Palisades, near Englewood, New Jersey.
Habitat group in American Museum of Natural History, New York.

AT HOME WITH THE BIRDS

Biddy Macleod was grim and black,
  With a face as sour as sin,
Had a limping leg, a crooked back,
  And a yellow and wrinkled skin.

She lived alone with her cat and crutch,
  In a hut on the edge o' the hill,
And when she crawled out in her old brown mutch,
  She was shunned as an omen of ill.

But early one morn when the snow lay thick,
  As I galloped by Biddy's door,
The beldame was out with her stout thorn stick,
  And was feeding the birds o' the moor.

The day passed by and at mid o' night
  I rode home i' the starlight still,
And methought I saw a halo of light
  Round the hovel on the hill.

And Biddy was there as fair within,
  As without she was grim and poor,
With a glory of heaven on her yellow skin,
  For she loved the birds o' the moor.

E. Charlton Black.

I DO not wish to think of living where birds cannot live with me. I never have lived in such a place, not even when I roosted on Beacon Hill in the upper story of the great city of Boston. I had sparrows there, little gutter snipes that they were; yes, and I had nighthawks booming in the dusk down to my chimney pots; and gulls coming in from the harbor; and wild geese honking over us in the fall from the frozen north. Besides, I had old Boston Common with its Frog Pond and elms, and the near "Gardens" beyond, where a dozen other birds lived and nested that you would expect to find only in the country.

Do you live in the city? Don't cry! Just get out early to the park or up on the roof or — if you have to — out on the fire escape, and if you have birds on your brain, or in your heart, you will have them on that wretched fire escape!

Now I live again, as I lived when a boy, in the open country, and here, according to one of my notebooks, are thirty-six species of birds nesting within singing distance of my study windows.

Where, you ask? Well, suppose we begin right where I am sitting as I write these words — in my study.

One of these thirty-six birds has a nest in the big chimney in the next room. These are the swifts.

HINTS FOR BIRD STUDY

I will come back to those swifts pretty soon. Let me stop for a few pages at this point and give you some general hints and suggestions for bird study. Persons who do not know the birds look upon the whole study as more difficult and mysterious than the Chinese alphabet. Not so — if you go about it with common sense, a pair of field glasses, a good bird book, love for the outdoors, and a fair share of patience. One thing more I ought to add; namely, if you go about it with the right and *best* purposes.

"To the real Nature lover," says Mr. Burroughs, "the bird in the bush is worth much more than the bird in the hand, because the Nature lover is not after a specimen: he is after a living fact; he is after a new joy in life.

"It is an important part but by no means the main part of what ornithology holds for us, to be able to name every bird on sight or call. To love the bird, to appreciate its place in the landscape and in the season, to relate it to your daily life, to divine its character, to know it emotionally in your heart — that is much more. To know the birds as the sportsman knows his game; to experience the same thrill, purged of all thoughts of slaughter; to make their songs music in your life — this is indeed something to be desired."

Yet we must get the bird that is in the bush into our *heads*, even if we don't care to have it in our hands. So let us have some instructions; and I can find none quite so compact and helpful as those by my friend Professor Herbert Eugene Walter, in his exceptionally handy and useful little bird book, "Wild Birds in City Parks."

IN CITY PARKS

But first, he says, speaking of the apparently birdless city parks: "During the migrations of the birds, city dwellers have one of the keenest delights of country life brought to their very doors, because many birds, migrating largely at night, are attracted by the lights of the city and stop off in their long journey to feed, so that a city park often contains a greater variety of feathered visitors than an equal area in the country.

GENERAL HINTS

"The identification of birds depends quite as much upon accurate observation of their size, motions, flight, characteristic attitudes, manner of feeding, company, song, call notes, and haunts, as upon details of form and color. Especial care is necessary to insure correct estimates of size, for the reason that living birds often appear smaller to the unpracticed eye than they actually are. The familiar English sparrow is a convenient standard of size, because it is often at hand either in city or country for instant reference. Remembering that it is six inches long, a practical though rough division of wild birds may be made as follows:

"1. Birds smaller than the English sparrow.

"2. Birds about the size of the English sparrow.

"3. Birds decidedly larger than the English sparrow.

"If a few general characteristics of the common bird families be kept in mind, and these are quickly and almost unconsciously learned, the identity of a strange bird may usually be narrowed down to a few possibilities. For example:

"Woodpeckers climb up and down the trunks of trees, bracing with their tails and tapping the bark vigorously.

"Nuthatches are smaller than woodpeckers and have much the same habit of climbing up and down tree trunks, but with a freer wig-wagging motion, often descending head downward.

"Flycatchers sit erect with drooping tails, watching alertly for insect prey, upon which they pounce in mid-air, afterwards returning to their perch.

"Swallows skim through the air in graceful and long-sustained flights.

"Sparrows have stout seed-cracking bills, feed upon the ground, seldom fly high or far at a time, and are for the most part fine songsters.

"Warblers are tiny, tireless, gayly colored explorers of the twigs of trees and bushes.

"Kinglets are smaller than warblers and quite as restless in their motions, but arrive earlier in the migration.

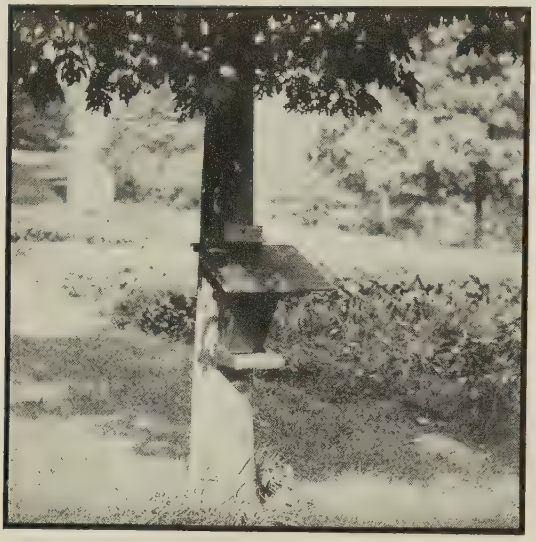
"Wrens, with tails erect, slip mouselike about brush heaps, crevices, and bushes, though often perching in sight while singing.

"Thrushes, which with the exception of the robins and bluebirds are very plainly dressed, run about on the ground, stopping suddenly in a listening attitude. When singing they fly up to some perch, although many of the unrivaled singers of this family are silent during their brief sojourn in city parks.

"Vireos are most at home on the boughs of

TWO FAMOUS AMERICAN NATURALISTS AND LOVERS OF THE WILD: JOHN MUIR AND JOHN BURROUGHS

John Muir, 1838–1914; John Burroughs, 1837–1921.



FEEDING BOX FOR BIRDS

trees and sing freely as they glide in and out among the leaves to feed.

"Female birds can usually be identified after the adult males have been seen, although the females and young of many species are obscurely marked or quite different from the adult males, a fact especially true of the warblers. Immature birds are not considered in the present scheme of study, since they are a source of confusion to the beginner and occur in any considerable number only during the fall migration.

"The time of arrival, that is, when a bird may be expected during the migration, is a point worthy of particular attention. Many wild guesses may be avoided by simply noticing the dates when a bird has been known to arrive in any given locality from year to year.

"By eliminating all birds whose arrival is decidedly earlier or later than that of the one in question, the matter is usually narrowed down to a few species whose identification is thus made much easier.

"The safest way, however, is to make careful notes on the spot about a stranger. Memory is never more treacherous than in the case of the description of a doubtful bird when one appeals to some book of reference, a museum collection, or the judgment of others. It is not advisable to attempt extensive 'field notes' at first, but *it is essential* to keep a daily, dated list of all identified birds.

"Never *chase* birds. Have patience, stand still a great deal, and use your common sense all the time.

"Do not make yourself believe that you see a certain bird because it has been reported by others. Do your own looking and listening, and do it well.

"If you cannot go birding alone, take along as few friends as possible, because birds are suspicious of human beings in flocks, especially when they move about much.

"A pair of field or opera glasses is a valuable aid, although practice is necessary in learning to adjust them rapidly and to fix them instantly upon the bird. Do not feel obliged to use the glasses when you are near enough to see well without them.

"Keep the sun at your back; otherwise colors will deceive you.

"Remember that birds do not stay 'indoors' on account of rain, clouds, or unfavorable weather. Warm spring rains literally fill the parks with feathered travelers who often tarry but a day."

WHERE TO LOOK FOR THE BIRDS

As I have said elsewhere, a strictly scientific arrangement of this part of the book would require the birds to follow one another according to their order and families, beginning with the grebes and winding up with the thrushes. But we are not ornithologists; we are trampers in the open, wishing to know what we see and hear, and wishing to know where to go in order to see and hear a particular bird, it may be.

A good scientific manual, such as Dr. Chapman's or Mr. Reed's, is necessary. A picture bird book that has the birds arranged like paint samples, according to their colors, might be of real use; but these do not meet our purpose; for we are afield all the time, now in the orchard, now in the high timber, now on the level marsh or prairie, and we wish to know what to expect and look for on any one of these particular tramps.

So we are going to group our birds, not by families, nor by color, but by *localities*. And we shall begin with those nearest to us — about the house we live in, and going on to the orchard and field and woods and marsh shall come at last to those of the most remote places. So let us make out a tramper's table of birds.

BIRDS ABOUT THE HOUSE AND BARN

Chimney swift, house wren, barn, tree, and eaves swallows, purple martin; phœbe, chippy, bluebird, robin, English sparrow, flicker, song sparrow, blue jay, starling, and many others at times.

BIRDS THAT NEST IN THE ORCHARD

All of those in the list above except the chimney swift, barn swallow, purple martin, phœbe, and eaves swallow; and besides these, the kingbird, chebec, crested flycatcher, orchard oriole, goldfinch, bronzed and purple grackles, cedar waxwing, redstart (at times), hummingbird, screech owl, and many others.

BIRDS THAT NEST IN THE UPLAND FIELDS

Many of this list are ground nesters, and most of them grayish-brown in color, like the tone of fields. The vesper, grasshopper, field, and Savannah sparrows, meadow lark, nighthawk, cowbird (when she can), killdeer, quail — and others at times.

BIRDS THAT NEST IN THE BRUSH AND WOODLANDS

In the low brush are found: The catbird, mocking bird, brown thrasher, towhee or chewink, the yellow-billed and black-billed cuckoos, the cardinal, mourning or turtle dove, and many of the warblers — chestnut-sided, yellow, etc.; the red-eyed vireo, blue-headed vireo, purple finch, wood thrush, cowbird, the nuthatches and titmice, the kinglets, the white-crowned, white-throated, tree, fox, and song sparrows, the junco, the crossbills, the grosbeaks, whip-poorwill, indigo bird, and chat.

And *in the tall woods* are found: The warblers almost without exception; the woodpeckers, the winter and the Carolina wrens, the tanagers, the nuthatches and titmice, the kinglets, the pewee, the water thrushes, the vireos, whip-poorwill, black-and-white warblers, ovenbird, crow, jay, hawks, and brown creeper.

BIRDS THAT NEST IN THE MEADOWS

Bobolink, meadow lark, red-winged blackbird, song sparrow, swamp sparrow, dickcissel, Maryland yellowthroat, and short-billed marsh wren.

BIRDS THAT NEST IN THE WET MARSH

The long-billed marsh wren, the sora or Carolina rail, the Virginia rail, the American and least bitterns, the avocet, coot, purple and Florida gallinules, and the pied-billed grebe.

BIRDS THAT NEST IN THE SALT MARSH

The seaside sparrow, sharp-tailed sparrow, fish hawk, and the bald eagle (on the edge of the marsh), the marsh owl, the marsh hawk, and the clapper rail.

BIRDS ALONG THE SWAMP CREEKS

The belted kingfisher, least bittern, little green heron, great blue heron, little blue and Louisiana herons, egret, snowy heron, black-crowned night heron, and the black duck.

BIRDS OF THE SHORE

The terns and gulls, plovers and sandpipers, the petrels, cormorants, and in the winter the ducks and geese and other seabird migrants.

BIRDS THAT SING FLYING

Among the birds that sing on the wing, are: bobolink, meadow lark, indigo bird, purple finch, ovenbird, kingbird, vesper sparrow (rarely), Maryland yellowthroat, horned lark, kingfisher, the swallows, the chimney swift, nighthawk, song sparrow, red-winged blackbird, pipit or titlark, mocking bird, swamp sparrow, chat, long-billed marsh wren, water thrush, and the red-shouldered hawk.

BIRDS THAT HAWK IN THE AIR

Birds seen in the air catching their food as they fly are: Acadian and alder flycatchers, great-crested flycatcher, least flycatcher, olivesided flycatcher, Say's phœbe, yellow-bellied flycatcher, kingbird, phœbe, wood pewee, purple martin, chimney swift, barn, bank, cliff, tree, and rough-winged swallows, Canada and Wilson's warblers, nighthawk, whippoorwill, ruby-throated humming bird, blue-gray gnatcatcher, redstart, and cedar waxwing.

BIRDS THAT PERCH IN THE OPEN

Among the birds that choose conspicuous perches are Northern shrike, loggerhead shrike, kingbird, wood pewee, phœbe and other flycatchers, swallows, kingfisher, crows, grackles, blue jay and Canada jay, song sparrows, grosbeak, cedar waxwing, goldfinch, robin, purple finch, cowbird, brown thrasher while in song, red-winged blackbird, and most of the hawks.

THE OBJECT OF THIS BOOK

BUT now to come back to those swifts. I said that within singing distance of my study windows one summer thirty-six different species of birds were nesting. Suppose we begin with those thirty-six and, going farther afield from their nesting sites, look into the habits of some of the wilder, shier, and rarer of our American birds.

For bear in mind that this volume is not a complete bird book or insect book or flower book, as has already been explained. This is a Nature-study book — a volume of suggestions for tramps afield. I am not an ornithologist, nor a botanist, nor a zoölogist, nor any other sort of an *ist.* I am making no pretensions to all knowledge, nor would I dream of trying in one book to give you bare descriptions even of all our American birds, to say nothing of the other things touched upon in this book. I wish to take you out in the fields, wish to make you wish to go — after birds if birds invite you, flowers if flowers invite you, frogs if frogs invite you. I wish to add a *little* to your knowledge, and a very great deal to your *pleasure* in the fields and woods.

So when we go afield for birds, why, we must start from my doorstep, go through my pasture fields, out into my meadows, and on into my woods and swamp lands — else I cannot go with you. Then, having gone with me, I hope you will start off alone into your own out-of-doors, though that may be at the very ends of the earth from the woods of Hingham.

BIRDS ABOUT THE HOUSE

HOW TO MEASURE A BIRD

JUST out of arm's reach in the big chimney nests the chimney swallow or swift, who, while the nearest to my fireside, is after all not the tamest of my birds. Yet, sharing my very fireside as he does, he surely ought to have a warm place in my heart; and he has. But where have I ever read one word by our popular bird writers, expressing the affection for him that is universally shown the bluebird?

I am thinking of our American swallow. We all know how Gilbert White loved his chimney swallows — how he loved every creature that flew or crawled about the rectory. Was it an ancient tortoise in the garden, the sheep upon the downs, a brood of birds in the chimney? No matter. Let the creatures manifest never so slight a friendliness for him, let them claim never so little of his protection, and the good rector's heart went out toward them as it might toward children of his own.

But the swallows were White's fondest care. He and his swallows were inseparable. He thought of them, especially those of the chimney, as members of his household. One can detect almost a father's interest and joy in his notes upon these little birds. Listen to the parent in this bit about the young. They are just out of the chimney.

"They play about near the place where the dams are hawking for flies; and when a mouthful is collected, at a certain signal given, the dam and the nestling advance, rising toward each other and meeting at an angle; the young one all the while uttering such a little note of gratitude and complacency that a person must have paid very little regard to the wonders of Nature that has not often remarked this feat."

Habits of the Chimney Swift. It is not generous to speak ill of anybody — not "nice" either to speak nowadays of insects that Robert Burns once wrote a poem about. Yet the swifts have them — I am sorry to say they do — bedbugs! But I have never found them infested, and if they are I don't believe the "bugs" would get out of a sooty chimney into your house.

On the other hand the swifts kill millions of gnats and pestering insects, feeding entirely upon them, catching them on the wing — as, indeed, they make love, gather twigs for the nest, and even seem to *rest*, on the wing.

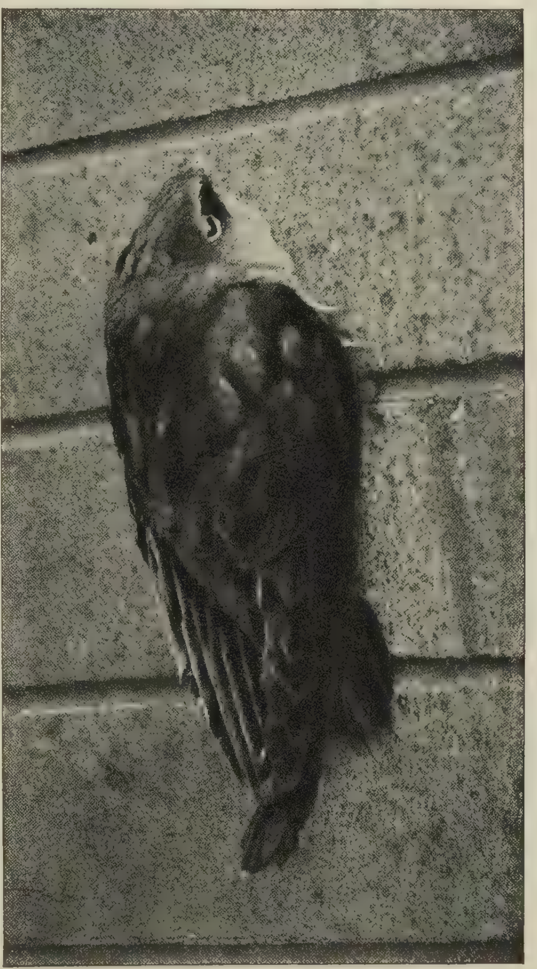
They are less musical than a small boy with "clappers." Nevertheless, I could ill spare them from my family. They were the first birds I knew, my earliest home being so generous in its chimney as to afford lodgings to several pairs of them. This summer they again share my fireside, squeaking, scratching, and thundering in the flue as they used to when, real goblins, they came scrambling down to peek and spy at me. I should miss them from the chimney as I should the song sparrows from the meadow. They are above the grate, to be sure, while I am in front of it; but we live in the same house, and there is only a wall between us.

Before this land was all smoking with chimneys, the swift built, as the little Vaux swift on the Pacific coast still builds, in the hollows of trees, gluing on its nest to the sides with a gummy substance from the salivary glands. In China this gum of the swift is cooked for soup.

The Purple Martins. When I was a boy a great colony of purple martins built in a long, narrow box across the end of my uncle's barn. The box was about one foot high and twenty feet long, with certainly fifty holes in it for fifty pairs of martins.

I used to wake in the morning to the chatter and twittering of those gleaming, glittering birds, the largest of our swallows, as they coursed through the dewy sunshine hawking for flies. That was years ago. The long, many-windowed box still spans the end of the barn — full of English sparrows! It is a sad story, and all the more so that such useful and beautiful martin colonies are disappearing before the sparrow everywhere. Some day the purple martin may become extinct. The chief cause will be the pestiferous sparrow.

The Barn Swallow. "Then out of the high heaven above, at once one hears the happy chorus of the barn swallows; they come rejoicing, their swift wings cleave the blue, they fill the air with woven melody of grace and music. Till early September they remain. Like the martins, their note is pure joy; there is no coloring of sadness in any sound they make. The sandpiper's note is pensive with all its sweetness; there is a quality of thoughtfulness, as it were, in the voice of the song sparrow; the robin has many sad cadences; in the fairy bugling of the oriole there is a triumphant richness, but not such pure delight; the blackbird's call is keen and



CHIMNEY SWIFT (*Chætura pelagica*)

The only bird that builds in chimneys; he never settles outside the chimney. When flying, he looks like a taut bow and arrow. Belongs to the swift family, not the swallow family.

sweet, but not so glad; and the bobolink, when he shakes those brilliant jewels of sound from his bright throat, is always the prince of jokers, full of fun, but not so happy as comical. The swallow's twittering seems an expression of unalloyed rapture — I should select it from the songs of all the birds I know as the voice of unshadowed gladness."[1]

You understand that the purple martin is not one of my present thirty-six home birds — but it ought to be. I mention him here because he is perhaps one of yours, and while we are speaking of the swallows it might be well to mention all of them that are common. For they are sociable folk among themselves, mixed bands of bank, barn, and cliff swallows being often seen migrating together.

The barn swallows are among the most friendly and really domesticated of wild birds. The old barn and wagon house under the hill is alive with them. This is now August and several nests have a second brood of young in them, while the earlier families gather daily here in the yard on the electric-light wires that run from the house to the pole in the trees.

"Upon the beams in the top of the barn the brown-breasted, fork-tailed barn swallows have made their mud nests for years. These birds are wholly domesticated. We cannot think of them as wild. And what a place in our affections they have won! If it is the bluebirds that bring the spring, the barn swallows fetch the summer. They take us back to the farm. We smell the hay, we see the cracks and knot-holes of light cutting through the fragrant gloom of the mows, we hear the munching horses and the summer rain upon the shingles, every time a barn swallow slips past us.

"For grace of form and poetry of motion there is no rival for the barn swallow. When on wing, where else, between the point of a beak and the tips of a tail, are there so many marvelous curves, such beautiful balance of parts? On the wing, I say. Upon his feet he is as awkward as the latest Herreshoff yacht upon the stays. But he is the yacht of the air. Every line of him is drawn for racing. The narrow, wide-reaching wings and the long, forked tail are the perfection of lightness, swiftness, and power. A master designed him — saved every possible feather's weight, bent from stem to stern, and rigged him to outsail the very winds."[2]

The flock instinct is most striking in the swallows. They are not only fond of human society, but fond of being together. Along the banks of the Kennebec River I know a great colony of bank swallows (sand martins); in the town of Klamath Falls, Oregon, and far out in the rim-rock country and its sagebrush deserts, I watched the cliff swallows with their wonderful flask-shaped adobe houses, and everywhere they flocked and built in colonies.

The tree or white-bellied swallow is the only one of the family that nests by itself, and that is largely because the trees are not full enough of holes.

The Tree Swallow. On one corner of the barn I have nailed up a piece of hollow apple-tree limb cut off in trimming the orchard. In this hollow limb is a nest of tree swallows, a lovely steely blue fellow with white breast and no particular fork to his tail. I said *is* a nest. No, not just now; there was one last year, and one was started this year, but before I knew it the English sparrows had got in and ousted them, and the other day the smallest of the four boys told us with great disgust that the old sparrows had just "set another batch of eggs" — a second brood!

Bank Swallow. These are the smallest of our swallows; this species can be distinguished, even at a distance, by the conspicuous band across the breast, showing in bold relief against the lighter throat. They are found throughout North America, breeding from the middle of the United States north to the arctic regions.

They nest in colonies in holes in banks, laying the four to seven white eggs on a grass nest in an enlarged chamber at the end of the tunnel.

Rough-winged Swallow. In this species the throat is gray as well as the breast. The outer vane of the outer primary is stiff and bristly, thus giving the species its name. These birds breed from the Gulf north to Massachusetts, in banks or in crevices of stone bridges. The eggs cannot with certainty be distinguished from those of the bank swallow.

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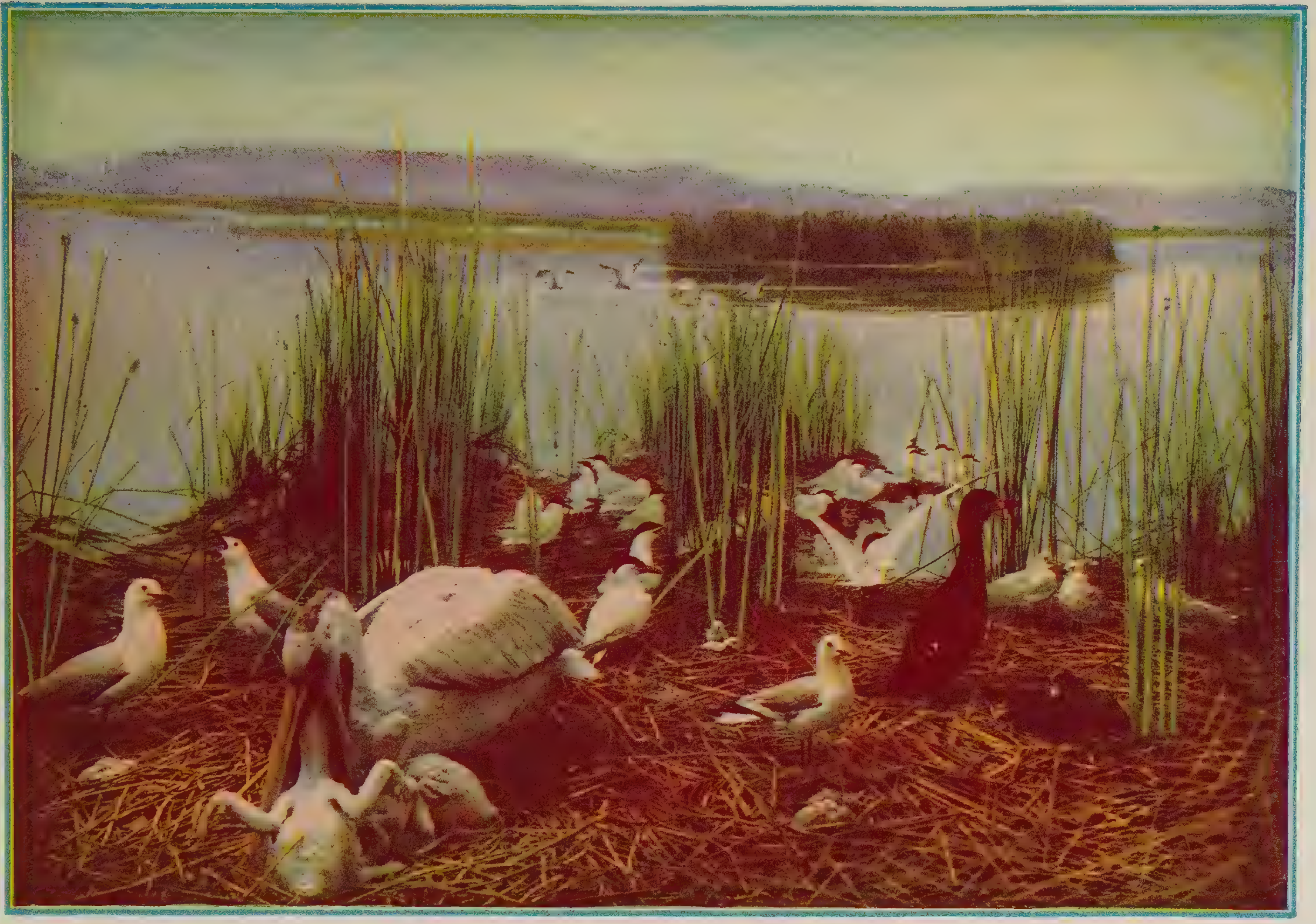
[1] From "An Island Garden," by Celia Thaxter. Published by Houghton Mifflin Company.
[2] From "Wild Life near Home." By permission of The Century Company.



BIRD-LIFE AT LOWER KLAMATH LAKE, OREGON-CALIFORNIA LINE

White Pelican, California Gull, Ring-billed Gull, Caspian Tern, Farallon Cormorant

Habitat group in American Museum of Natural History, New York

Phœbe. Around behind the barn, under the pigpen, dwells Phœbe — and has these twelve years to my certain knowledge — nesting on the same little shelf (a limb now) since I put it up for him on the rafter seven years ago. Phœbe belongs to the flycatcher family, other members in the East being the kingbird, great-crested flycatcher, least flycatcher, wood pewee, yellow-bellied, alder, and green-crested flycatchers.

A phœbe is usually associated with old bridges. Nearly every bridge which is at all adapted for the purpose has its phœbe home beneath it, to which the same pair of birds will return year after year, sometimes building a new nest, sometimes repairing the old. They are of a nervous temperament, for, as they sit upon their lookout perch, their tails are continually twitching as though in anticipation of insects; and they will fly into the air calling a jerky, emphatic *phœ-be*, with the accent on the second syllable, and still further accented by the vigorous flirt of the tail.

The nest is of mud, grasses, and moss, plastered to the sides of beams or logs under bridges or culverts or in barns. In May or June four or five white eggs are laid.

I have told the story of my phœbe in a chapter called "A Palace in the Pigpen" in "The Lay of the Land." You will find me hoping in that chapter that Phœbe may return to me "next spring." Well, he did, and has ever since. Now I am hoping that they both return next spring, to bring off two broods as they have this summer.

Think of it — birds in my chimney, in the corner of my barn, in my barn loft and under my pigpen! What does it mean? Just this: "You have taken a handful of my wooded acres," says Nature, "and if you have not improved them, you at least have changed them greatly. But they are mine still. Be friendly now, go softly and you shall have them all — and I shall have them all, too. We will share them together."

And we do. Every part of the fourteen acres is mine, yielding some kind of food or fuel or shelter. And every foot, yes, every foot, is Nature's; as entirely hers as when the thick primeval forest stood here. The apple trees are hers as much as mine, and she has ten different bird families, that I know of, living in them this spring. A pair of crows and a pair of red-tailed hawks are nesting in the wood lot; there are at least three families of chipmunks in as many of my stone piles; a fine old tree toad (his fourth season now) sleeps on the porch under the climbing rose; a hornets' nest hangs in a corner of the eaves; a small colony of swifts thunder in the chimney; swallows twitter in the hayloft; a chipmunk and a half-tame gray squirrel feed in the barn; and — to bring an end to this bare beginning — under the roof of the pigpen this pair of phœbes!

Is this all that it means — to have this pair of phœbes in the pigpen?

No, because he speaks the friendship of Nature.

"'Humble and inoffensive bird' he has been called by one of our leading ornithologies — because he comes to my pigpen! 'Inoffensive'! this bird with the cabbage butterfly in his beak! The faint and damning praise! And 'humble'? There is not a humble feather on his body. Humble to those who see the pen but not the bird. But to me — why, the bird has made a palace of my pigpen!

"The very pig seems less a pig because of this exquisite association; and the lowly work of feeding the creature has been turned by Phœbe into an esthetic course in bird study."[1]

The Least Flycatcher — Chebec. It is not a stone's throw from the nest of the phœbe to that of its cousin, the little chebec, or least flycatcher, in the apple orchard. They are known by the name of chebec, because their notes resemble that word. Their nests are placed in upright forks of any kind of trees or bushes; they are made of plant fibers and grasses closely felted together. The eggs range from three to five in number and are creamy white, without markings.

"From the window one morning I saw Chebec light upon the clothesline. She teetered a moment, balancing her big head by her loosely jointed tail, then leaped lightly into the air, turned — as only a flycatcher can — and, diving close to the ground, gathered half the gray hairs of a dandelion into her beak, and darted off. I followed instantly, and soon found her nest in one of the orchard trees.

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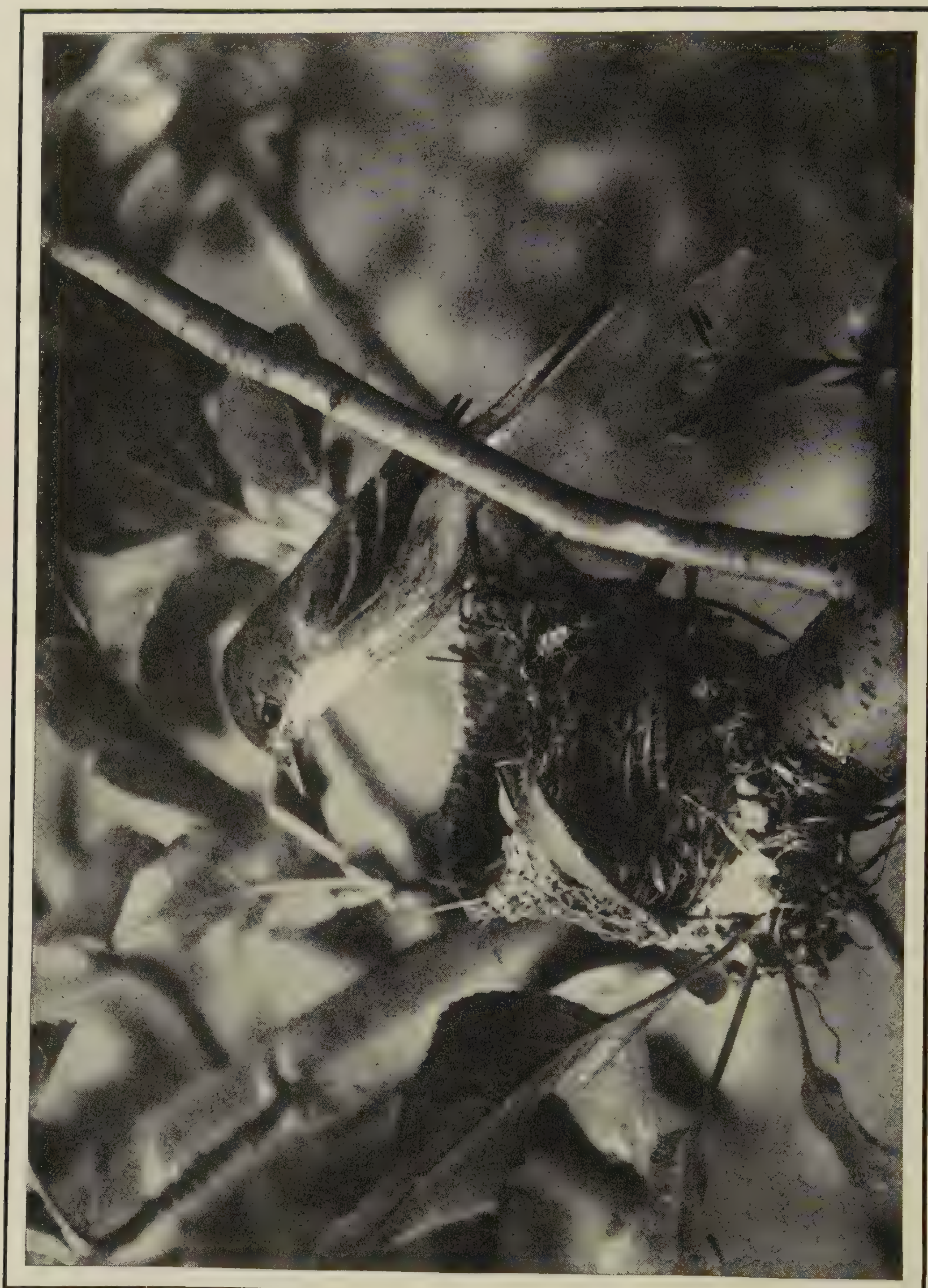
[1] From "The Lay of the Land."



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LEAST FLYCATCHER ON NEST

It was not quite finished; and while the bird was gone for more of the dandelion down, I climbed up and seated myself within three feet of the nest.

"Back came Mrs. Chebec with a swoop, but, on seeing me, halted short of the nest. I was motionless. Hopping cautiously toward the nest, she took an anxious look inside; finding nothing disturbed, she concluded that there was no evil in me, and so went on with her interesting work. It was a pretty sight. In a quiet, capable, womanly way she laid the lining in, making the nest, in her infinite mother love, fit for eggs with shells of foam.

"The chebec is a finished architect. Better builders are few indeed. The humming bird is slower, more painstaking, and excels Chebec in outside finish. But Chebec's nest is so deep, so soft, so round and hollow! There is the loveliness of pure curve in its walls. And small wonder! She bends them about the beautiful mold of her own breast. Whenever she entered with the dandelion cotton, she went round and round these walls, before leaving, pressing them fondly with her chin close against her breast. She could not make them sufficiently safe nor half lovely enough for the white, fragile treasures to be cradled there." [1]

The Crested Flycatcher. In the orchard with Chebec in our apple-tree hole dwells the largest of the flycatchers — the crested flycatcher.

Writing of this bird in "Wild Life near Home," I said: "A striking illustration of the growing alliance between us and the birds is this nest of the great-crested flycatcher in the orchard. Greatcrest has almost become an orchard bird. At heart he is, and ever will be, a bird of the wilds. He is not tame — does not want to be tame; he is bold, and the dangers and advantages of orchard life attract him. His moving into an apple orchard is no less a wonder than would be an Apache chief's settling in New York or Boston.

"Most observers still count Greatcrest among the wild and unreclaimed. Florence A. Merriam, speaking of his return in spring, says, 'Not many days pass, however, before he is so taken up with domestic matters that his voice is rarely heard outside the woods'; and in Stearns' 'Birds' I find, 'It does not court the society of man, but prefers to keep aloof in the depths of the forest, where it leads a wild, shy, and solitary life.' This is not Greatcrest as I know him. I have found many of his nests, and never one in any but orchard trees.

"I disagree, too, with most descriptions of

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[1] From "Wild Life near Home."

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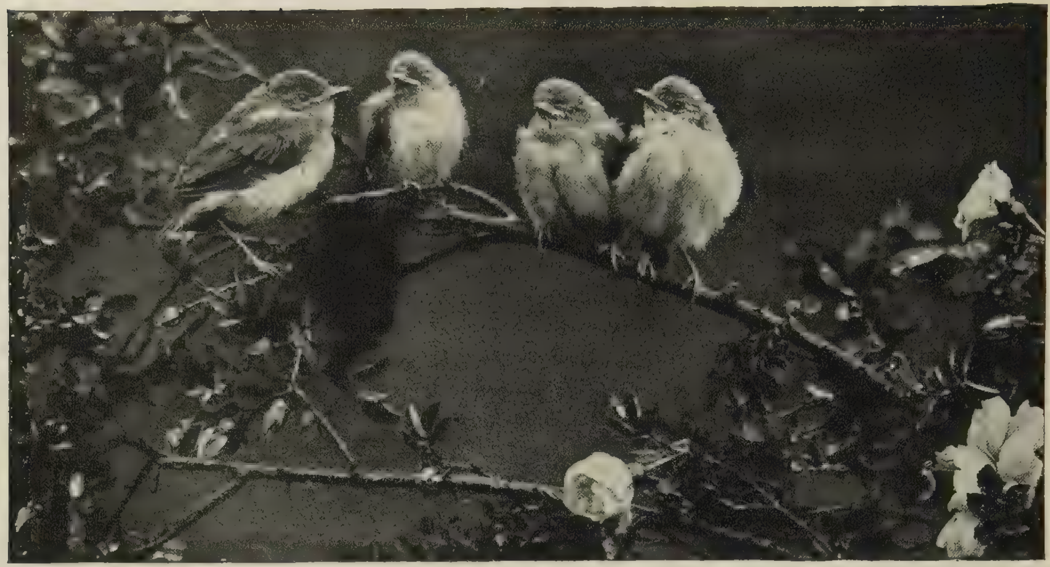
CRESTED FLYCATCHER (*Myriarchus crinitus*) AT NEST HOLE



LEAST FLYCATCHERS, OR CHEBECS (*Empidonax minimus*)

this bird's cry. The authors I have read seem never to have heard him on a quiet May morning across a fifty-acre field. His voice is 'harsh and discordant' when sounded into one's very ears. The sweetest-toned organ would be discordant to one inside the instrument. Give the bird the room he demands — wide, early-morning fields — and listen. A single shout, almost human it seems, wild, weird, and penetrating, yet clear and smooth as the blast of a bugle. One can never forget it, nor resist it; for it thrills like a resurrection call — the last, long summons to the spring waking. This solitary note is often repeated, but is never so rapid nor so long drawn out as the call of the flicker.

"What other bird lines his nest with snakeskins, or hangs such grewsome things out for latchstrings? He has taken up his residence among us, but he has given us pretty plainly to understand that we need not call, else I mistake the hint in the scaly skin that dangles from his door. The strong personality of the bird is stamped even upon its eggs. Where are any to match them for curious, crazy coloring? The artist had purple inks, shading all the way from the deepest chestnut-purple to the faintest lilac. With a sharp pen he scratched the shell from end to end with all his colors till it was covered, then finished it off with a few wild flourishes and crosswise scrawls."

The Kingbird. You all know the kingbird — bee martin — sauciest, hottest-tempered of all our orchard birds. He is another flycatcher, half an inch shorter than Greatcrest, but two or three feet longer in temper. His Latin name is *Tyrannus tyrannus*.

From the time of their arrival in May until they leave us in August, kingbirds are much in evidence in farmyards and orchards. They are one of the most noisy of birds, always quarreling about something, and usually coming off victorious in whatever they may undertake. Crows are objects of hatred to them, and they always drive them from the neighborhood, vigorously dashing upon and pecking them from above and often following them for a great distance. They have their favorite perches from which they watch for insects, usually a dead branch, a fence post, or a tall stalk in the field. Here they watch, springing off with a series of shrill, harsh sounds like *thsee, thsee.*

He is not an enemy of the bee keeper, for he kills only drones. There is no better bird friend to man than he.

You must read Mrs. Olive Thorne Miller's essay on the kingbird in her charming bird books. The wood pewee is so nearly like in appearance to the other small flycatchers that I want to mention him here, although I shall not describe him until later among the wood birds.

A CHIPPING SPARROW FAMILY: ONE BABY SATISFIED, THE NEXT NEARLY SO, THE THIRD STILL HUNGRY

BACK AGAIN AT THE HOUSE

Among the dwellings framed by birds
In field or forest with nice care,
Is none that with the little Wren's
In snugness may compare.

. . . . . .

And when for their abodes they seek
An opportune recess,
The hermit has no finer eye
For shadowy quietness.
Wordsworth, *The Wren's Nest.*

Come up again with me to the house, for there is one little housewife among the birds, a veritable little fussy Martha, that you must know, and that is Jenny Wren. When you catch a wren at rest and a weasel asleep, please report to the President — or anybody. Give her a box with an entrance no larger round than a silver quarter (to keep sparrows out), and no matter how big the box she will fill it with sticks. Fidgety, fussy, with never enough to do, the little wren will keep the whole neighborhood astir and hunting for work.

Last summer, in our little house on the Willamette in Oregon, we had two broods of the house wren come out of a little bird house on a fir tree. In visiting friends at Kenilworth, Ill., on my way home I found that my brother-in-law had just required some workmen on his place to move at large expense a bracket lamp from his porch to a near-by tree in order to let a family of wrens nesting in it continue their family affairs. The bracket lamp had to come down, but it was done by easy stages, and the old birds followed it to the tree and there brought up their babies with all success.

YOUR HOUSE BIRDS MAY BE DIFFERENT

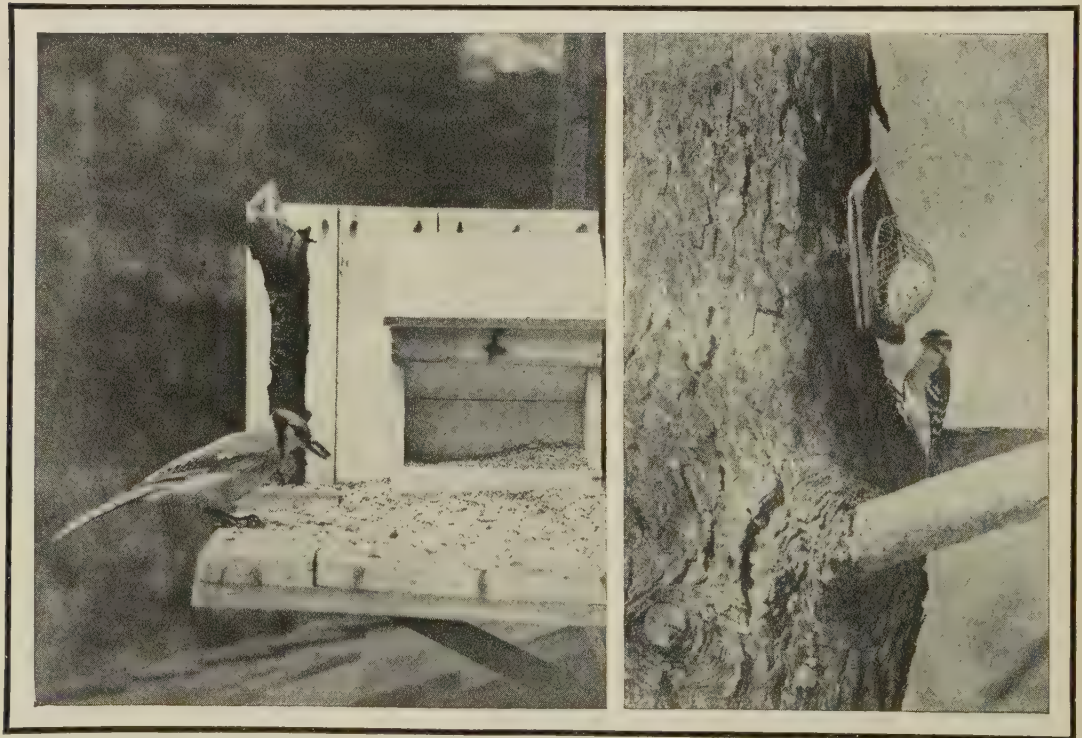
What house birds you have depends a great deal upon where you live. In England, for instance, we have known the rook as a house bird since we have known anything; and in New Jersey the crow blackbirds (purple grackles) correspond in size, color, and habits very closely to the English rook. In England again the barn owl is a common house bird (yard bird). That is so in New Jersey too. When I was a boy a pair built in the belfry of the old meetinghouse past which I went to school. In Holland the stork is a house bird, but I know of nothing like the wild stork in our country. Down in Rhode Island I have seen fish hawks' nests on the tops of tall poles in the dooryards, the people having fixed a wagon-wheel tire to the top of the pole to give support to the nest; and away off on the South Jersey marshes I have seen a fish hawk's nest on the top of a chimney in a deserted house. The hawks and owls, however, are not house birds in any sense.

The Bluebird. In my neighborhood the bluebird (*Sialia sialis*) is a common house bird. One pair has built for years in a box on the barn. I have found them in the open woods, but more and more I think they tend to become semi-domesticated. If you can keep the sparrows away and will put up a box for him, you can be pretty sure of a bluebird home in your yard.

There is something so reserved, so gentle and refined in their voice and manner as to shed an atmosphere of good breeding about the whole yard. What a contrast they are to the English sparrows! What a rebuke to city manners!

They are the first to return in the spring; the spring, rather, comes back with them. They are its wings. It could not come on any others. If it tried, say, the tanager's, would we believe and accept it? The bluebird is the only possible interpreter of those first dark signs of March; through him we have faith in the glint of the pussy willows, in the half-thawed peep of the hylas, and in the northward flying of the geese. Except for his return, March would be the one month of all the twelve never looked at from the woods and waysides. He comes, else we should not know that the waters were falling, that a leaf could be plucked in all the bare, muddy world.

Our feelings for the bluebird are much mixed. His feathers are not the attraction. He is bright, but on the whole rather plainly dressed. Nor is it altogether his voice that draws us; the snowflakes could hardly melt into tones more mellow, nor flecks of the sky's April blue run into notes more limpid, yet the bluebird is no singer. The spell is in the spirit of the creature's smile in the agony of her civilization. Men may level the forests, clear the land and fence it; but as long as they plant orchards, bird life, at least, will survive and prosper.



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FEEDING-STATION VISITORS

Blue jay and downy woodpecker.

The Robin. Along with the bluebird we certainly must count the robin. They both belong to the thrush family, and are the only two among them that are not strictly of the woods. The other common members are the hermit, wood, and Wilson thrush, or veery, and in migration, the three forms which breed to the north, the gray-cheeked thrush with its southerly relative, the Bicknell's thrush, and the Swainson's, or olive-backed thrush.

Last summer in the tree next to the chebec's nest, already mentioned, was a brood of robins. The thick adobe nest was wedged carelessly into the lowest fork of the tree, so that the cats and roving boys could help themselves without trouble. The mother sputtered and worried and scolded without let-up, trying to make good her foolishness in fixing upon such a site by abundance of anxiety and noise.

The fussiest, least sensible mother among the birds is the robin. Any place for her nest but a safe one! The number of young robins annually sacrificed to pure parental carelessness is appalling. The female chooses the site for the home, and her ability for blundering upon unattractive and exposed locations amounts to genius. She insists upon building on the sand. Usually the rain descends, the floods come, the winds blow, and there is a fall.

"Here is a pair building upon a pile of boards under a cherry tree; another pair plaster their nest to the rider of an old worm fence; while a third couple, abandoning the woods near by, plant theirs, against all remonstrance, upon the top of a stepladder that the brick makers use daily in their drying sheds.

'It was the superlative stupidity of this robin that saved her family. The workmen at first knocked her nest off to the ground. She had plenty of clay at hand, however, and began her nest again, following the ladder as it moved about the shed. Such amazing persistence won, of course. Out of wonder, finally, the men gave the ladder over to her and stood aside till her family affairs were attended to. Everything was right in time. After infinite scolding, she at last came off in triumph, with her brood of four."[1]

The English Sparrow.[2] "More common even than the robin are two plebeian English immigrants, the starling and the English, or house, sparrow. The latter needs no description; its habits and noisy chatter are too well known. English sparrows build on the eaves of buildings, in the crevices about street lights, and in the boxes put out for bluebirds, or erect their clumsy masses of sticks (which pass for nests) in the trees of our city parks. They are annoying but withal, smart, difficult to outwit, and quite the 'gamins' of the city. Of recent years they have become less common as the horse has been driven out by the automobile."

The Starling.[3] "This is a very different bird. He is larger, almost the size of the robin, but with a shorter tail, and with a very different bearing; in fact, his scientific name *vulgaris* is well chosen, for he has many common or vulgar traits, being quarrelsome, garrulous, noisy, and gregarious. Within the last twenty-five years starlings have spread in ever-widening circles from the vicinity of New York and New Jersey, where they were first introduced, so that now hardly a section east of the Mississippi is free from them.

"He is a blackbird to general appearance; but if you approach closely you will see that his iridescent back is clearly marked with cream-buff spots. All in all, with the bright yellow bill, which is long and pointed, he presents a trim appearance.

"Starlings are very partial to city halls, church steeples, and buildings with hollow gutters or elaborate cornices, where they roost in numbers. The young are raised in holes, often those from which the starling has driven the larger flicker by force of numbers. In the fall and winter they congregate in large flocks which perform elaborate evolutions, being governed as if by a master mind as they swing through the air, sometimes in a funnel-shaped swirling cloud, sometimes in a compact mass, or again just as a loose flock. In the city of Washington, D. C., they roost on the public buildings. It was quite surprising to see them perched at night even on the sign of a brightly lighted motion-picture house.

"Economically they are not wholly a pest, as they devour numerous cutworms, grasshoppers, beetles, and the like during the nesting season, when they are scattered about the country. Their capacity for mischief is greatly enhanced by their habit of flocking and by their skill in driving out species like the bluebird, crested flycatcher, red-headed woodpecker and flicker, which nest in similar places. They have increased enormously in the East and are birds which should be familiar to everyone. Their variety of notes is stimulating. A pair will whistle like a boy, imitate the bobwhite, cowbird, wood pewee, meadow lark, and then break off into a series of conversational chuckles which cannot be duplicated. When in doubt of a bird note, search the starling! His repertoire is endless."

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[1] From "Wild Life near Home."

[2] By Warren F. Eaton.

[3] By Warren F. Eaton.

The Chippy. Every year (they never fail) a pair or more of chipping sparrows nest in the old-fashioned climbing rosebush over the kitchen door.

The chippy has a chestnut crown, a black forehead, and a black line through the eye. These are among our commonest and most useful sparrows. They are not at all timid and frequently nest in vines, covering porches or the side of the house, provided that English sparrows are not too plenty. They eat great quantities of insects and worms, and some seeds, feeding their young wholly upon the former. Their song is a very rapidly chanted *chip, chip, chip, chip,* continued for several seconds; the call is a sharp *chip.*

The nest is a small, cup-shaped structure of rootlets, lined with horsehair; placed in bushes, trees, or vines; eggs three to five, bluish-green, specked, chiefly round the large end, with blackish-brown.

You will all come to know and love the chippy. One of our bird writers tells this story of the nest in her boxwood tree *on* the veranda of her house, and I am sure we can all pretty nearly match her account:

"From the back of a settle, the round of a rocking-chair, or the gnomon of the sundial near the veranda, the little chippy would trill his wiry tremolo, like the locust's hot-weather warning, while his mate brooded over five tiny greenish-blue eggs in the boxwood tree. Before even the robin was awake, earlier than dawn, he would start the morning chorus with the simple little trill that answers for a song to express every motion throughout the long day. Both he and his mate use a *chip* call note in talking to each other.

"When she was tired brooding, of which she did far more than her share, he would relieve her while she went in search of food. Very often he would carry to the nest a cabbage worm for her or some other refreshing delicacy. Every member of the family parted the twigs of boxwood that enclosed the nest to look upon her pretty little reddish-brown head with a gray stripe over the eye and a dark-brown line running apparently through it. All of us gently stroked her from time to time. She would occasionally leave the nest for only a minute or two to pick up the crumbs, chickweed, and canary seed scattered for her on the veranda floor, and showed not the slightest fear when we went on with our regular occupations. We were the breathlessly excited ones, while she hopped calmly about our feet. The chippy is wonderfully tame — perhaps the tamest bird that we have."[1]

Tree Sparrow. About the time when the fall flocks of chippies disappear in October, this near relative appears from the north. Superficially, the tree sparrow looks like an enlarged edition of our common chipping sparrow; but it may be distinguished by white wing bars, a blackish-brown spot in the middle of the breast; crown reddish-brown with no black about the head; back and wings with considerable brown.

These sparrows pass the summer in the Arctic region and only appear for the winter in the northern half of the United States, becoming frequent visitors in our fields and gardens, ready customers for the hay seed thrown from the barn or for the grain at the feeding box. They are cheerful birds with a distinctive "tsip" call note and a conversational chirping which is very attractive on a bright winter day, as a flock flits and flutters through a patch of weeds half-buried in a new fall of snow. The song, which is heard at first haltingly in late March or April, is a musical "whee-hee-ho-hee-sweet, sweet," only slightly inferior to the fox sparrow.

The Flicker. There is one other "house bird" that I must include here — the golden-shafted flicker or high-hole. He is not exactly

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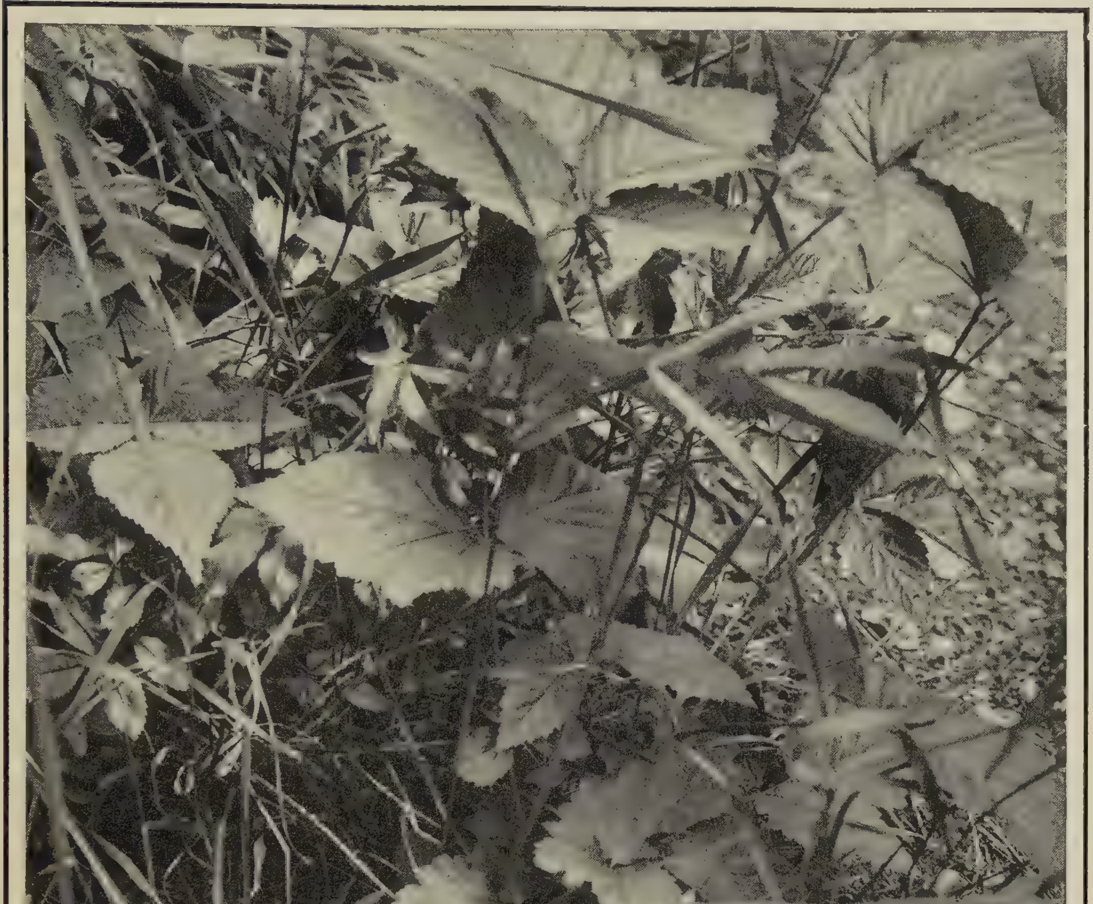
[1] From "Birds Every Child Should Know."



CUP-SHAPED, HORSEHAIR-LINED NEST OF CHIPPING SPARROW *persona grata* when he takes to the house or barn, because he bores holes into the roof and actually lets the rain into the attic and on the hay in the barn. Nor do the street-car and telephone companies think well of him when he takes to their nice smooth *dead* poles.

HIGH-HOLE AND CIVILIZATION[1]

Some of my friends were talking of birds, when one of them turned to me and said hopelessly: "It's no use. We can't save them even if we do stop wearing them upon our hats. Civilization is bound to sweep them away. We shall be in a birdless world pretty soon, in spite of laws and Audubon societies."

I made no reply, but, for an answer, led my friends to the street and down the track to a pole which High-hole had appropriated. I pointed out his hole, and asked them to watch. Then I knocked. Instantly a head appeared at the opening. High-hole was mad enough to eat us; but he changed his mind, and, with a bored, testy flip, dived into the woods. He had served my purpose, however, for his head sticking out of a hole in a street-railway pole was as a rising sun in the east of my friend's ornithological world. New light broke over this question of birds and men. The cars drive High-hole away? Not so long as cars run by overhead wires on wooden poles.

High-hole is a civilized bird. Perhaps "domesticated" would better describe him; though domesticated implies the purposeful effort of man to change character and habits, while the changes which have come over High-hole — and over most of the wild birds — are the result of High-hole's own free choosing.

If we should let the birds have their way, they would voluntarily fall into civilized, if not into domesticated, habits. They have no deep-seated hostility toward us; they have not been the aggressors in the long, bitter war of extermination; they have ever sued for peace. Instead of feeling an instinctive enmity, the birds are drawn toward us by the strongest of interests. If Nature anywhere shows us her friendship, and her determination, against all odds, to make that friendship strong, she shows it through the birds. The way they forgive and forget, their endless efforts at reconciliation, and their sense of obligation ought to shame us. They sing over every acre that we reclaim, as if we have saved it for them only; and in return they probe the lawns most diligently for worms, they circle the apple trees for grubs, and gallop over the whole wide sky for gnats and flies — squaring their account, it may be, for cherries, orchards, and chimneys.

The very crows, in spite of certain well-founded fears, look upon a new farm as a godsend. In the cold and poverty of winter the crows, jays, quails, buntings, and sparrows help themselves, as by right, from our shocks and cribs. Summer and winter the birds find food so much more plentiful about the farm and village, find living in all respects so much easier and happier here than in remote, wild regions, that, as a whole, they have become a suburban people.

But life is more than meat for the birds. There is a subtle yet real attraction for them in human society. They like its stir and change, its attention and admiration. The shiest and most modest of the birds pines for appreciation. The cardinal grosbeak, retiring as he is, cannot believe that he was born to blush unseen — to the tip of his beautiful crest. And the hermit thrush, meditative, spiritual, and free as the heart of the swamp from worldliness — even he loves a listener, and would not waste his sweetness any longer on desert forest air. I do not know a single bird who does not prefer a wood with a wagon road through it.

My friends had smiled at such assertions before their introduction to the bird in the pole. They knew just enough of woodpeckers to expect High-hole to build in the woods, and, when driven from there, to disappear, to extinguish himself rather than stoop to an existence within walls of hardly the dignity and privacy of a hitching post.

He is a proud bird and a wild bird, but a practical, sensible bird withal. Strong of wing and mighty of voice, he was intended for a vigorous, untamed life, and even yet there is the naked savage in his bound and his whoop. But electric cars have come, with smooth-barked poles, and these are better than rotten trees, despite the jangle and hum of wires and the racket of grinding wheels. Like the rest of us, he has not put off his savagery: he has simply put on civilization. Street cars are a convenience and a diversion. He has wings and wildest freedom any moment, and so, even though heavy timber skirts the track and shadows his pole, and though across the road opposite stands a house where there are children, dogs, and cats, nevertheless, High-hole follows his fancy, and, instead of building back in the seclusion and safety of the woods, comes out to the street, the railroad, the children, and the cats, and digs him a modern house in this sounding cedar pole.

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[1] From "Wild Life near Home."

Perhaps it is imagination, but I think that I can actually see High-hole changing his wood ways for the ways of the village. He grows tamer and more trustful every summer.

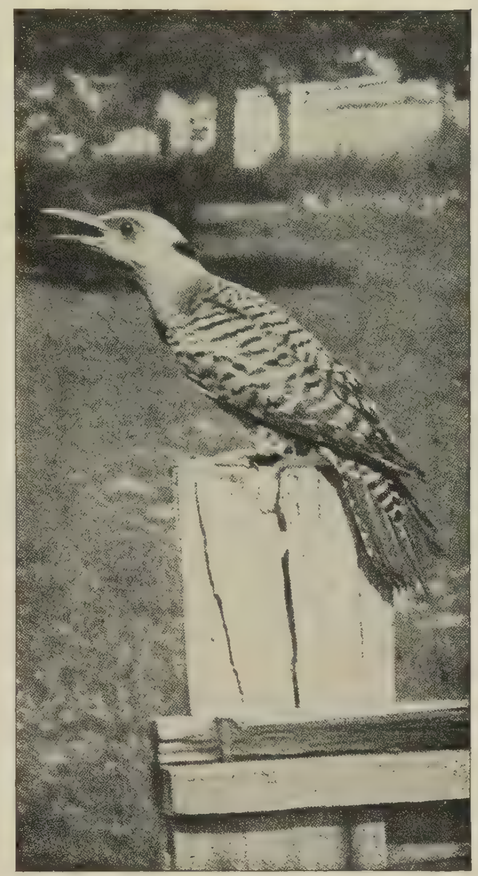
A pair have their nest in a telegraph pole near the schoolhouse, where they are constantly mauled by the boys. I was passing one day when two youngsters rushed to the pole and dragged out the poor harassed hen for my edification. She was seized by one wing, and came out flapping, her feathers pulled and splintered. She had already lost all but two quills from her tail through previous exhibitions. I opened my hands, and she flew across the pasture to the top of a tree, and waited patiently till we went away. She then returned, knowing, apparently, that we were a necessary evil of town life.

But this pole life marks only half the distance that these birds have come from the woods.

One warm Sunday of a recent March, in the middle of the morning sermon, a ghostly rapping was heard through the meetinghouse. I paused. *Tap, tap, tap!* — hollow and ominous it echoed. Every soul was awake in an instant. Was it a summons from —? But two of the small boys grinned; someone whispered "Flicker"; and I gathered my ornithological wits together in time to save the pause and proceed with the service.

After the people went home I found three flicker holes in the latticework over the north windows. One of last year's tenants had got back that morning from the South, and had gone to work cleaning up and putting things to rights.

This approach of the flicker to domestic life and human fellowship is an almost universal movement among the birds. And no tendency anywhere in wild life is more striking. The four-footed animals are rapidly disappearing before the automobile and the spreading town; the birds seem to accept these encroachments and adapt themselves to them. Yet one never gets used to the contrast in the bird life of uninhabited places with that about human dwellings. Thoreau tells of his disappointment at the dearth of birds in the Maine woods; Burroughs reads about it, and goes off to the mountains, but has himself such an aggravated shock of the same surprise that he also writes about it. The few hawks and rarer wood species found in these wild places are shy and elusive. More and more, in spite of all they know of us, the birds choose our proximity over the wilderness. Indeed, the longer we live together, the less they seem to fear and suspect us.


HIGH-HOLE THE FLICKER (*Colaptes auratus*)

THE EXQUISITE CEDAR WAXWING OR CHERRY BIRD (*Bombycilla cedrorum*), FREQUENTER OF ORCHARDS

BIRDS OF THE ORCHARD

GIVE THE BIRDS AN INVITATION

GIVE the birds an invitation! I said in the last chapter that the birds are anxious for our friendship, taking every chance to be friendly, because, if we are willing, life with us is much more interesting and protected. If that is true, should we not more than meet them halfway — seeing that millions of dollars a year depend upon their keep in our farming, to say nothing of the joy they give the whole world of human beings by their beauty and songs and ways?

About the house, then, and in the orchard put up a number of bird houses and plant a few of the vines and brushes that furnish seed and berries, not only when the lean days come, but also for the fat days to make them fatter and bring the birds about you.

The bird-house pictures which appear on these pages need no architect's specifications and no trained builder for their construction. Scrap boxes, sticks, nails, hammer, saw, and *one live boy* who has had a jackknife since he was six years old — that is all that is necessary. I will add on the following pages several other pictures, on account of the many valuable hints they offer.

SOME DESSERTS FOR THE BIRDS

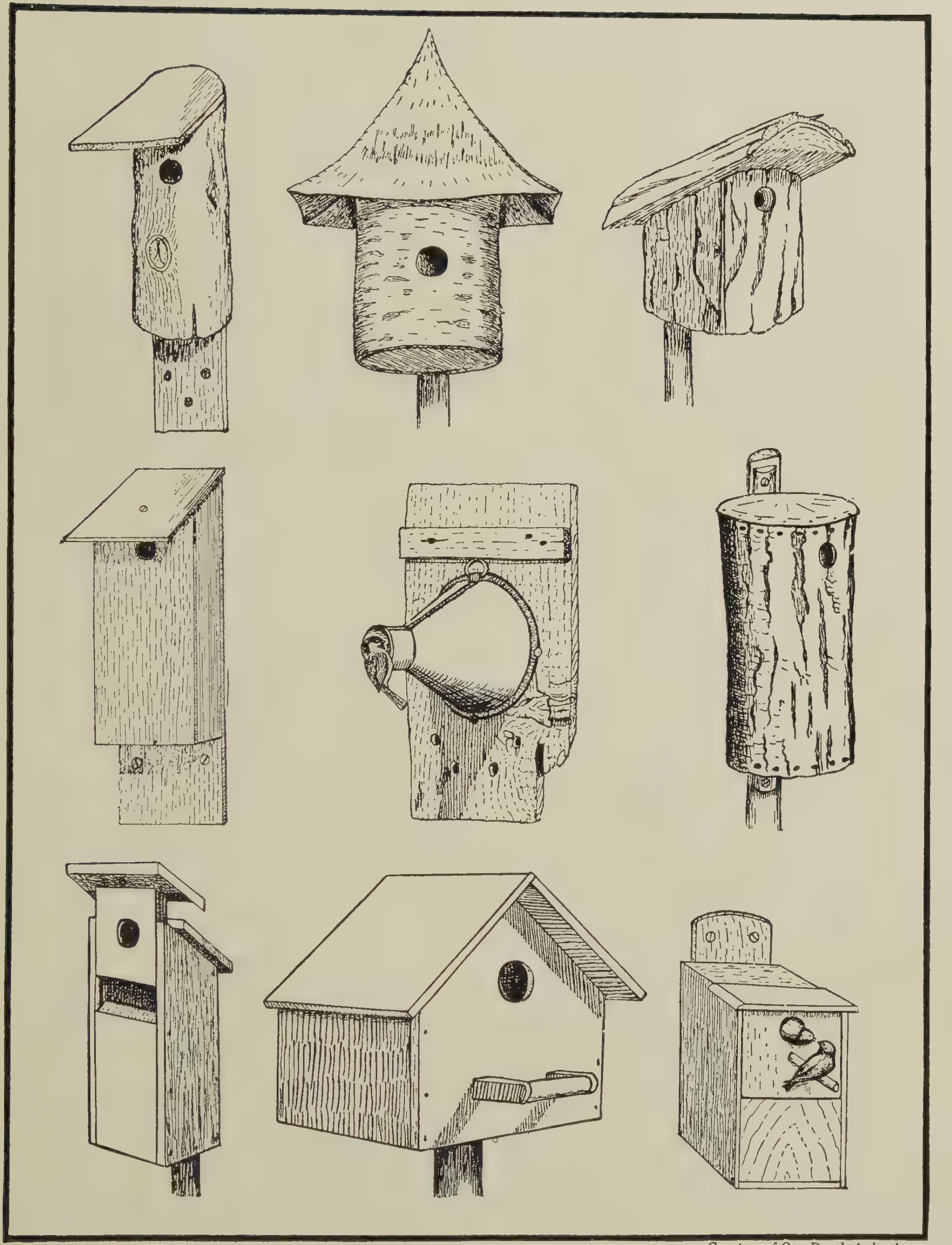
Mrs. Blanchan, in her charming book, "How to Attract the Birds," says that if the dooryard can hold but one tree it should be a Russian mulberry.

"No other one will attract so many feathered visitors as the Russian mulberry. Robins, catbirds, tanagers, grosbeaks, waxwings, orioles, and thrushes are not by any means the only appreciative visitors with the poor sense to prefer the insipid, sweet fruit, to the best berry God ever made."

I should say not — not unless I was born a robin or an oriole — for I had rather climb up a juicy mulberry tree until I am black in the face than get into anybody's strawberry bed.

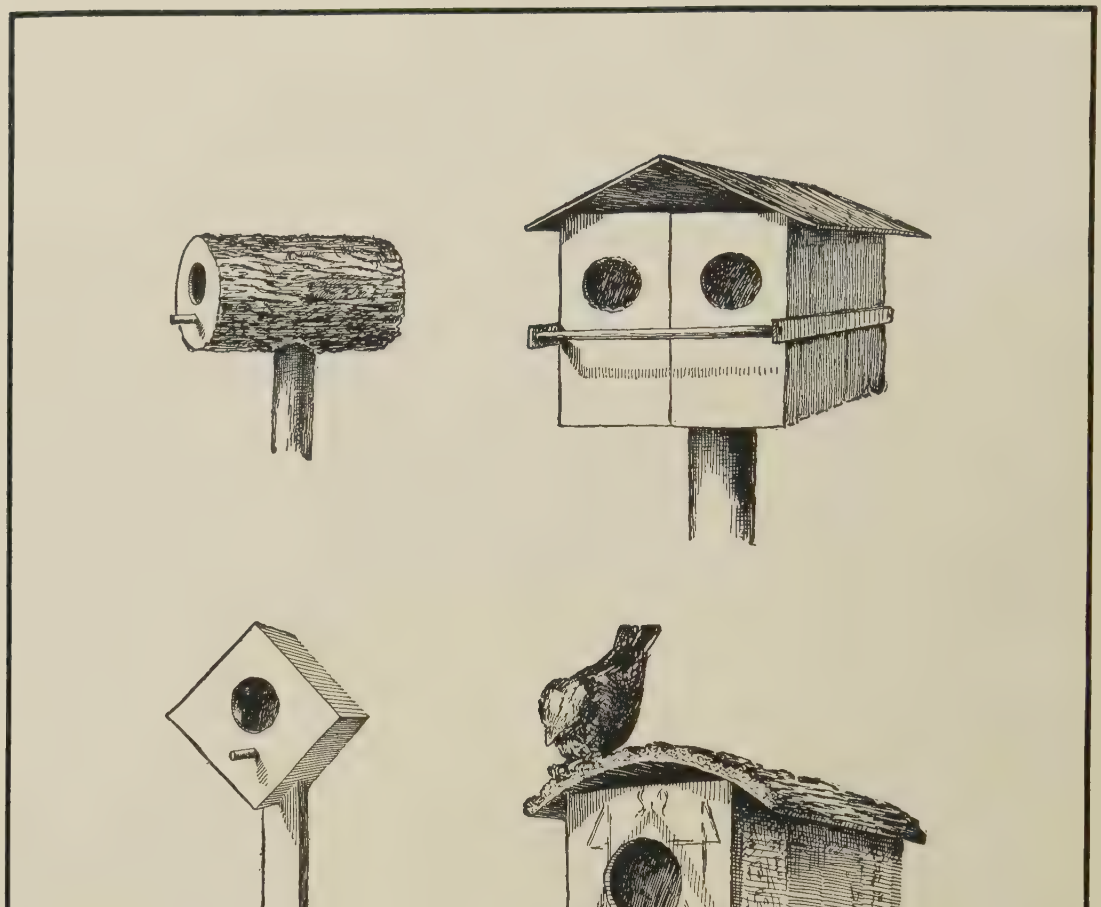
"Probably the next best food tree," she says, "for birds is the chokecherry, whose racemes of small black fruit ripen from July to September. Here congregate large flocks of crested cedar waxwings, more properly called cherry birds, one thinks, when the distended gullets of these sociable gourmands are observed through the opera glass.

"Tree and bush dogwoods, mountain ash, spruces, pines, juniper, hawthorn, viburnum, elder, black alder, wild plums, blackberries, cherries, crab apples, currants, raspberries,



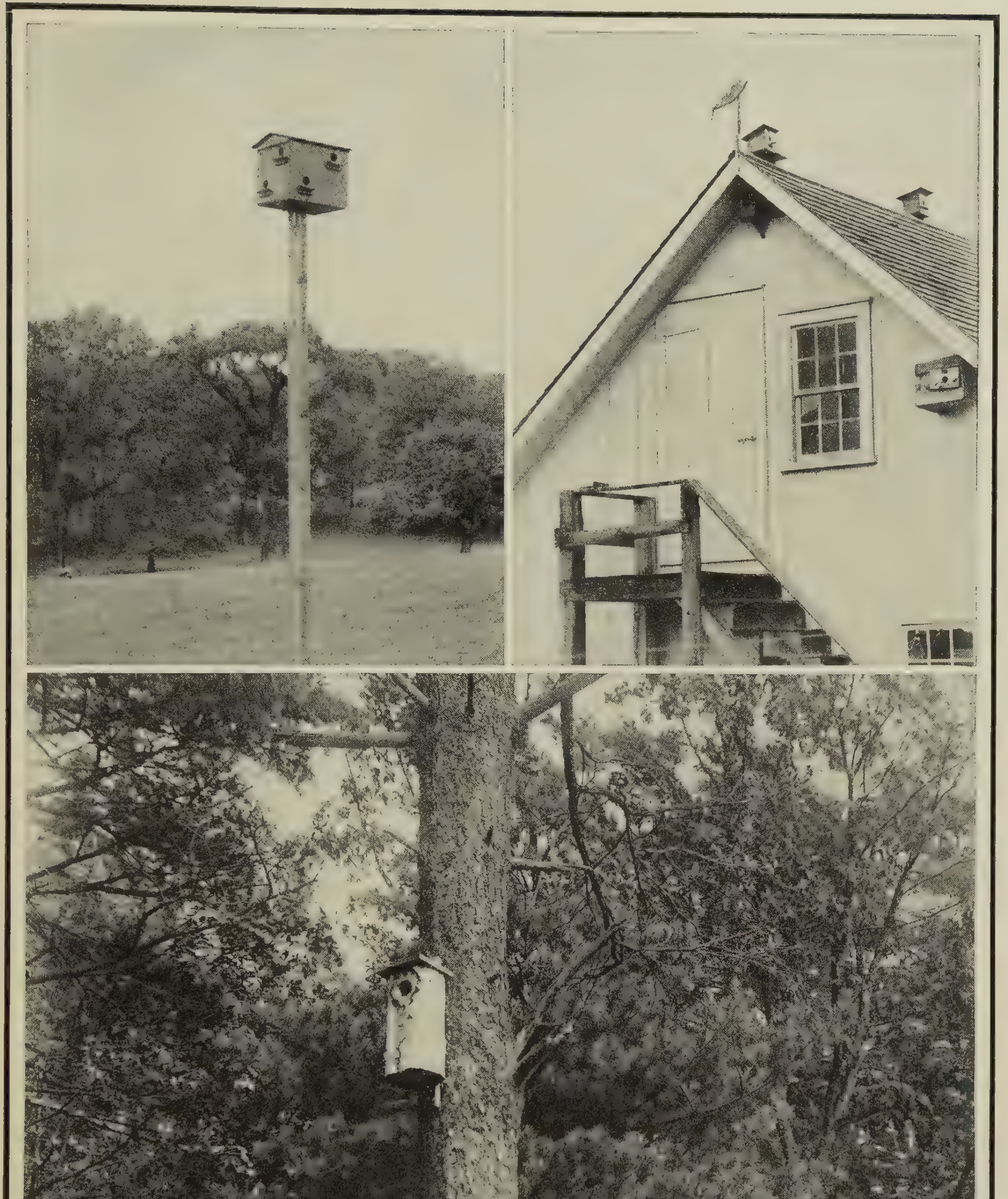
Courtesy of Our Dumb Animals

SOME EASILY MADE BIRD HOUSES



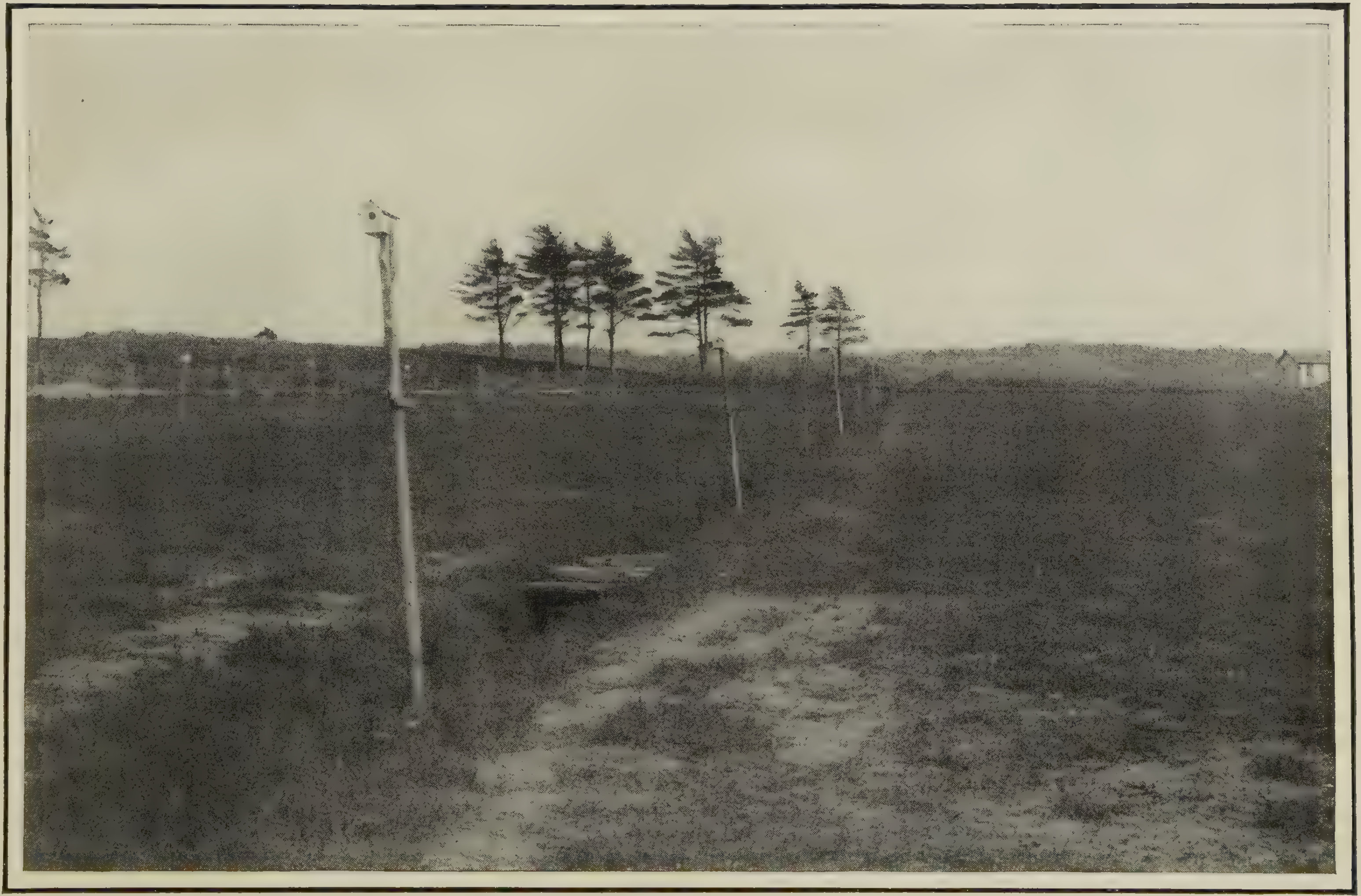
MORE BIRD HOUSES

See the old inverted funnel on the pole to keep the cats from climbing up.



BIRD HOUSES IN ACTIVE SERVICE

Upper left: Martin box divided into rooms. Upper right: Bird houses on shed of a Connecticut farmer whose bird friends cleared his fields of insect pests. Bottom: Bird house invented by a German nobleman. This style of structure is the result of a large number of experiments.



ONE HUNDRED AND FIFTY MARTIN HOUSES ON ONE CRANBERRY BOG

Each house has two compartments and thus accommodates two families of birds. Previous to erecting these houses the owner spent hundreds of dollars and much valuable time each year in spraying this bog, the necessity for which has now entirely ceased.

grapes and gooseberries, catbrier, burning bush, moonseed, wild yam, buckthorn, sumach, holly, bittersweet, wild rose, wintergreen, partridge vine, hackberry, snowberry, kinnikinic, auralia, honeysuckle bushes and twiners, mock orange, hopvine, huckleberries, Virginia creeper, clematis, bayberries, shadbush — these are among the many wild and cultivated trees, shrubs, and bushes whose fruit attracts the birds."

For the winter, when natural seeds and provender fail, tie up a piece of suet to the window, or on a bush in the yard. You will not only feed the birds but you will feed and clothe and entertain the whole human family indoors as well — for the body, you know, is more than raiment, and life more than meat.

"Minced raw meat, waste canary, hemp, and sunflower seed, buckwheat, cracked oats and corn, crumbs and the sweepings from the hayloft, scattered over the ground, make a delectable hash for feathered boarders with varied appetites. Food that can be put in dishes on piazza roofs or on shelves in trees either winter or summer for such soft-billed birds as robins, catbirds, mocking birds, thrushes, and orioles — the most delightful and tuneful of bird neighbors — is made of equal parts of cornmeal, pea meal, and German moss, into which enough molasses and melted suet or lard have been stirred to make a thick batter. If this mixture is fried for half an hour, it can be packed away in jars and will keep for weeks. Grated carrot or minced apple is a welcome addition."

But I shall treat of this again later. Let us now go on with our study of the birds that are nesting within earshot of my study windows, as these are the birds everyone should know. And now we will go from the house back to the orchard.

BACK TO THE ORCHARD

As we have seen, the birds about the house are also those in the orchard very largely; no line can be drawn between them. But there are certain orchard birds that *prefer* the orchard. Among these we have already seen the kingbird, the chebec, the crested flycatcher, the robin, and the tree swallow. Besides these you will find in your old orchard, as I find in mine, the exquisite cedar waxwing, or "cherry bird," or cedar bird. The orchard is his favorite nesting place. It is there that he builds a nest very much like the kingbird's in general appearance.

"Waxwings," says Dr. Chapman, "possess in an unusual degree two characteristics which are not supposed to be associated — sociability and silence. None of our birds is more companionable, none more quiet. In their fondness for one another's society they seem to delay the pairing season, and long after other birds have gone to housekeeping they are still roving about in flocks. Finally, late in June, they settle down and build a nest of generous proportions, often in some fruit tree, about ten feet from the ground. The three to five eggs are pale bluish-gray or putty-colored, spotted with black or brownish-black.

"Waxwings fly in close rank and alight as near each other as the nature of their perch will allow. They sit very still, like little parrots or doves, but often raise and lower their crests, and perhaps whisper a fine lisping note, which is prolonged into a louder call — a string of beady notes — as they take wing.

"Their fare varies with the season — cedar berries, strawberries, cherries, both cultivated and wild, the berries of the woodbine, some green and others being taken in turn."

Late in the summer the waxwing turns flycatcher, destroying great numbers of canker worms too, by which he more than makes up

FRIENDS

By H. T. Bohlman and W. L. Finley

RUFOUS HUMMING BIRD (*Selasphorus rufus*)

for what he steals in the way of buds and fruit.

The Orchard Oriole. In all the years I have lived in Massachusetts I have found only one orchard oriole's nest, and that was at Brockton Heights in a little apple tree. But in the old orchards of my boyhood they were as common as Baltimore orioles here along the elm-shaded roads of New England. But they, for some reason, are not widely found, nor ever abundantly. Study pictures of this bird carefully, especially the female, for in her olive-green suit she slips among the green leaves and you may never know that you have seen her. An interesting characteristic of this bird's plumage is found in the young male's looking the first summer exactly like its mother. The next summer it returns "wearing its father's black cravat." But the adult chestnut-and-black plumage is not put on until the bird's third spring. A young orchard oriole might be taken for some new species.

The Purple Grackle. I don't know where your grackles build, but, as I have already said, they have come to take the place of the English rook in many localities, a favorite building place being the tall evergreens or hardwoods about country houses and the trees about the ponds in public parks. You must read Lowell's charming essay upon them in "My Garden Acquaintance."

Perhaps they are neither of the house nor of the orchard. Yet they do not belong with the wood birds, preferring groves — an old cemetery to any other place—where tall, somber trees and quiet give them undisturbed possession.

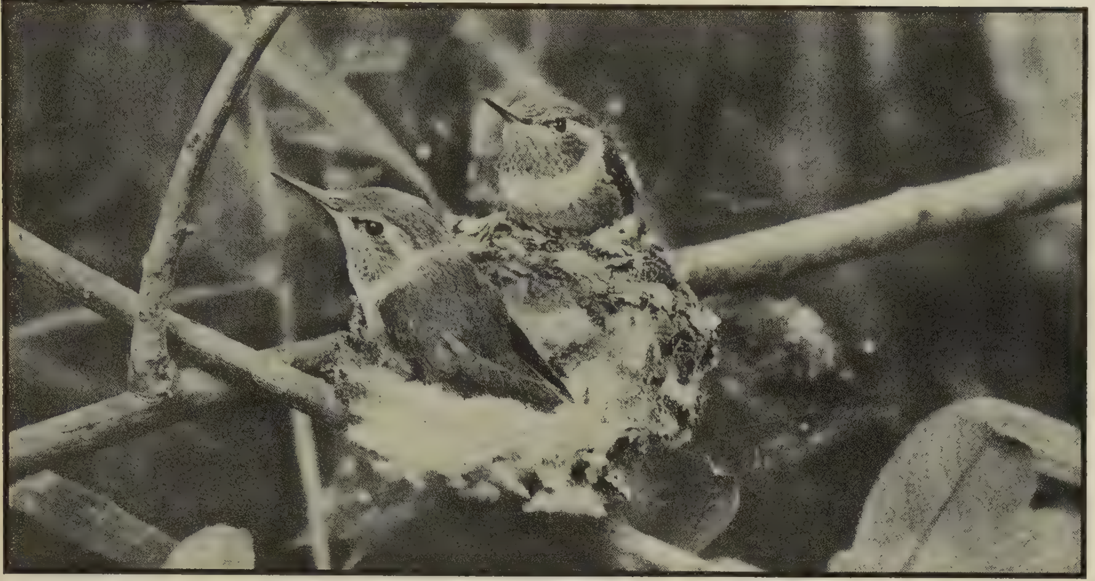
But I find them (for lack of better place, it may be) in the apple orchard with great, bulky nests in the tops of the trees.

Watch them *walk!* See them roll their white eyes! They are more solemn than owls.

There are two of these grackles — the purple and the bronzed. The purple breeds from the *lower* Mississippi Valley and east of the Alleghanies from Georgia to Massachusetts; the bronzed (which looks exactly like it except that it lacks the iridescent bars on the feathers) breeds from Texas to Pennsylvania, thence to Connecticut, and on to Labrador.

The Rubythroated Humming Bird.

A flash of harmless lightning,
  A mist of rainbow dyes,
The burnished sunbeams brightening,
  From flower to flower he flies;



By H. T. Bohlman and W. L. Finley

YOUNG HUMMING BIRDS IN THEIR LICHEN-COVERED NEST

While wakes the nodding blossom,
  But just too late to see
What lip hath touched her bosom
  And drained her nectary.
JOHN B. TABB.

With me the humming bird is of the orchard family. He loves an old lichen-covered pear tree or a long, wide-waving branch of an apple tree. I have found him in the woods too — so I suppose people have found needles in haystacks, also. Last summer we had a nest by the spring in an English ivy vine that swung across the path from a large cottonwood on the Willamette — only that was little rufous humming bird of the Pacific coast. Another built in a Virginia creeper. I have begged Mr. William Lovell Finley, who took its pictures, to let me put them in here, as I think it is the most beautiful humming-bird picture ever photographed. You will want to read his delightful story of the birds in his book called "American Birds."

Of all the cradles by birds or men the nest of the humming bird is the daintiest, loveliest, most like to some exquisite bit of goldsmith's work. Both birds, I think, build it, but the male takes little or no part in family affairs after incubation begins. Humming birds lay two white eggs — "frail, pearly ellipses, that after ten days' incubation develop into a tangle of tiny pink limbs and bodies, which no one would think of calling birds, much less winged gems."

Humming birds are peculiar to the New World. About four hundred species are known, only one of them found east of the Mississippi, our rubythroat. The rubythroat winters as far south as Central America. "About May 1 we may expect him to return to us," says Dr. Chapman, "for he is as regular in his migrations as though his wings measured a foot and a half instead of an inch and a half in length. If you would have him visit you, plant honeysuckle and trumpet flowers about your piazza, and while they are blooming there will be few days when you may not hear the humming of this tiny bird's rapidly vibrating wings.

"The rubythroat feeds on insects as well as on the juices of flowers, and when you see him probing a corolla he is quite as likely to be after the one as the other. The young are fed by regurgitation, the parent bird inserting its bill into the mouth of its offspring and injecting food as though from a syringe."

Rubythroat is so far domesticated that he rejoices over every new flower garden. There was nearly half an acre of gladioli in the neighborhood one summer, where all the humming birds gathered from far and near. Here, for the only time in my life, I saw a *flock* of humming birds. I counted eight one day; and the gardener told me that he had often seen a dozen of them among the spikes. They squeaked like bats, and played — about as bullets might play. In fact, I think I dodged when they whizzed past me, as a soldier does the first time he is under fire.

One of my friends had a cellar window abloom with geraniums. A rubythroat came often to this window. One day the mistress of the flowers caught the wee thing in her hands. He knew at once that she meant no harm and quietly submitted. A few days later he returned and was captured again. He liked the honey, and evidently the fondling, too, for he came very regularly after that for the nectar and the lady's soft hands.

There was a nest behind my garden, in the top of a tall, slender maple, with oaks and chestnuts surrounding and overshadowing it. "Finding a nest like this is inspiration for the rest of life. No one ever deliberately started into the woods a-saying, 'Go to, now; I 'll find a humming bird's nest in here!'

"Humming birds' nests are the gifts of the gods — rewards for patience and for gratitude because of commoner grants. My nests have invariably come this way, or, if you choose, by accident. The nearest I ever came to earning one was in the case of this one in the maple. I caught a glimpse of a humming bird flashing around the high limbs of a chestnut, so far up that she looked no bigger than a hornet. I suspected instantly that she was gathering lichens for a nest, and, as she darted off, I threw my eyes ahead of her across her path. It was just one chance in ten thousand if I ever saw her speeding through the limbs and leaves, if I got the line of her flight, to say nothing of a clew to her nesting place. It was little short of a miracle. I had tried many times before to do it, but this is the only time I ever succeeded: my line of vision fell directly upon the tiny builder as she dropped to her nest in the sapling.

"The structure was barely started. I might have stared at it with the strongest glass and never made it out a nest; the sapling, too, was no thicker at the butt than my wrist, and I should not have dreamed of looking into its tall, spindling top for any kind of a nest. Furthermore, as if to rob one of the last possibility of discovering it, a stray bud, two years before, had pushed through the bark of the limb about three inches behind where the nest was to be fixed, and had grown, till now its leaves hung over the dainty house in an almost perfect canopy and screen.

"For three weeks the walls of this house were going up. Is it astonishing that, when finished, they looked like a growth of the limb, like part and parcel of the very tree? I made a daily visit to the sapling until the young birds flew away; then I bent the tree to the ground and brought the nest home. It now hangs above my desk, its thick walls, its downy bed, its leafy canopy telling still of the little mother's unwearied industry, of her infinite love and foresight. So faultlessly formed, so safely saddled to the limb, so exquisitely lichened into harmony with the green around, this tiniest nest speaks for all of the birds. How needless, how sorry, would be the loss of these beautiful neighbors of our copses and fields!"[1]

The Redstart. It may not be safe to call the little redstart an orchard bird either, I have elsewhere said, but here he is in my apple trees. He belongs to the woods, perhaps, and must be reckoned a visitor to the apple trees, only an occasional builder, at best. The orchard is too open for him. He is an actor, and needs a leafy setting for his stage. In the woods, against a dense background of green, he can play butterfly with charming effect, can spread himself and flit about like an autumn leaf or some wandering bit of paradise life, with wings of the grove's richest orange light and its deepest shadow.

When, however, he has a fancy for the orchard, this dainty little warbler shows us what the wood birds can do in the way of friendship and sociability.

Across the road, in an apple tree whose branches overhang a kitchen roof, built a pair of redstarts. No one discovered the birds till the young came; then both parents were seen about the yard the whole day long. They were as much at home as the chickens,

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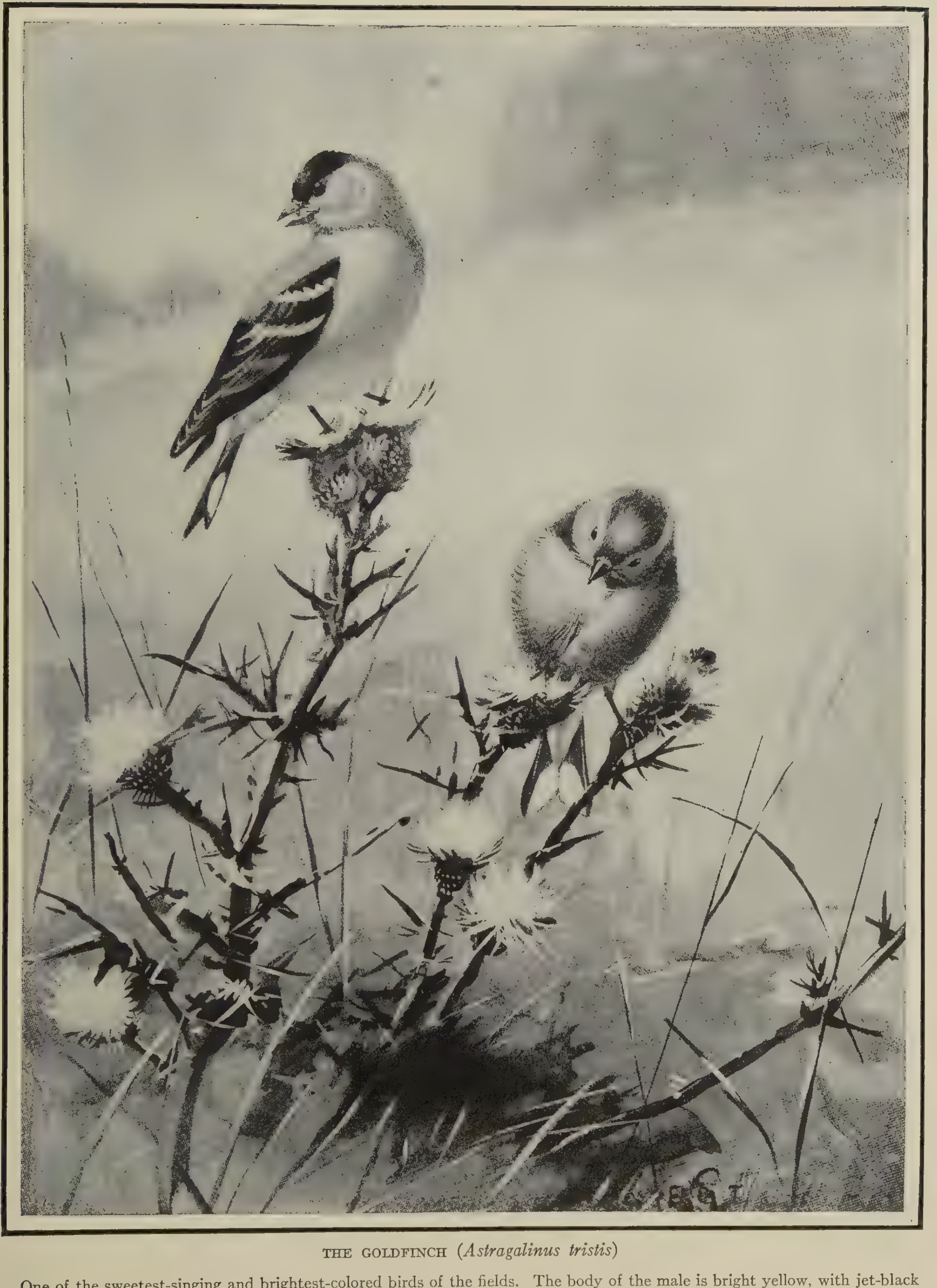
[1] From "Wild Life near Home."



THE GOLDFINCH (*Astragalinus tristis*)

One of the sweetest-singing and brightest-colored birds of the fields. The body of the male is bright yellow, with jet-black on cap, wings, and tail. Drawing by Ernest Thompson Seton. From Stickney's "Bird World." By permission of Ginn & Co.

even more familiar. Having a leisure moment one day, when a bicycle was being cleaned beneath the tree, the inquisitive pair dropped down, the female actually lighting upon the handlebar to see how the dusting was done. On another occasion she attempted to settle upon the baby swinging under the tree in a hammock; and again, when I caught one of her own babies in my hands, she came bringing a worm and without a quiver of fear tried to settle upon my closed hands to feed her baby! She was a little daunted by the trap that held her child, however, and could n't quite touch her feet to it. Had my hands been *open* she would have settled at once!

"The redstart's bright colors," says Dr. Chapman, "like some mark of special distinction, are not acquired at once. The young male must pass through a period of probation before he is worthy to wear the orange-red and black. In the meantime he appears first in the costume of the female, and by successive changes reaches the full dignity of redstart estate at the age of three years. He nests, however, the first year, when his plumage closely resembles that of his mate. The nest, of fine strips of bark, plant down, and other materials, is built in the crotch of a sapling ten to twenty feet from the ground. The eggs are grayish-white or bluish-white, spotted and blotched, chiefly at the larger end, with cinnamon and olive-brown. They are laid about May 28 — four weeks after the bird's arrival from the South."

The Goldfinch. I don't know where you find the goldfinch, but I find him either about the house in the rose or lilac bush, or else down in the apple trees. In fact, I find him summer and winter so near to my house and so near to my heart that I think he really understands that I have adopted him and already willed to him all the land and all the sky and all sunflowers and ragweeds that I possess.

Everybody feels so toward him. Here, for instance, is Dr. Chapman saying:

"His gentle ways and sweet disposition are never failing antidotes for discontent. One cannot be long near a flock of these birds without being impressed by the refinement which seems to mark their every note and action. . . .

"In April the males regain their bright colors, but they are evidently believers in prolonged courtship, and although the nuptial crest is acquired so early, housekeeping is apparently not thought of until June. Then a neat home of bark and fine grasses, thickly lined with plant down, is placed in a bush or tree, five to thirty feet from the ground, and in it are laid three or six pale, bluish-white eggs.

"Now the song season has reached its height. Chorus singing has been abandoned. Each bird has become an inspired soloist, and, perched near his home or flying in broad circles about it, pours forth a flood of melody. It is an exceedingly attractive song, sweet and varied and suggesting a canary's, but still is no more like it than a hothouse is like a tropical forest."

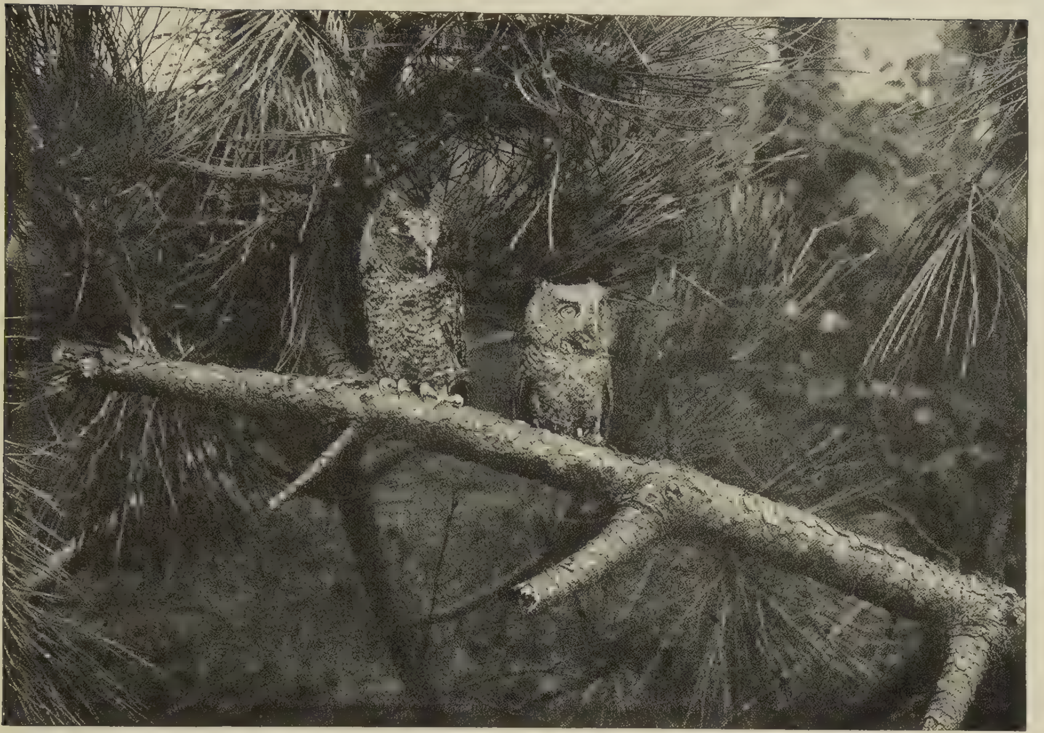
The Screech Owl. Of all the misnomers in bird land, *screech* owl is the worst. Call the blackbird white and the Jimson weed sweet, if you will, but don't *screech* when you think of this little orchard owl.

I hear one now in the orchard — a faint, quivering, sorrowful call above the throbbing of the crickets and green grasshoppers. The close night air is tremulous with its whimpering little cry.

The nest tree is beside the drive — an old Baldwin apple. On our way up the path from the public road we can stop and look in at it through a basement window (we cut it) — at the eggs in April, and then later at the young ones.

The screech owls have a strange way of changing their color without changing their feathers, as molting song birds change theirs. They have a rusty, reddish-brown phase and a mottled-gray phase. So far as is known, these changes of color are not dependent upon age, sex, or season. What causes them and what do they mean? No one knows. The same family will contain birds with plumage that is rusty-brown or gray or intermediate. You may always know a screech owl by its small size (it is only about as long as a robin) and by the ear tufts.

During the day it keeps well hidden in some deserted hole or a hollow in some old orchard tree, which is its favorite home; but the mischievous little birds, with sharper eyes than ours, often discover its hiding place, wake it up, and chase it, blinking and bewildered, all about



Photographed by Silas A. Lottridge
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A PAIR OF YOUNG SCREECH OWLS (*Otus asio*)

The name of these birds is misleading. Their call is not a "screech" at all, but an eerie, tremulous cry.

the farm. At night it goes forth for its supper, and then we hear its weird, sweet, shivering, tremulous cry.

"At twilight, in the late spring and early summer, we frequently hear a gentle, eerie call from the woods or from below in the orchard. What is it? I had been asked a hundred times, and as many times had guessed that it might be the hen partridge clucking to her brood; or else I had replied that it made me think of the mate call of a coon, or that I half inclined to believe it the cry of the woodchucks, or that, possibly, it might be made by the owls. In fact, I did n't know the peculiar call, and year after year I kept guessing at it.

"We were seated one evening on the porch listening to the whip-poor-wills, when someone said, 'There 's your woodchuck singing again.' Sure enough, there sounded the tremulous woodchuck-partridge-owl-coon cry. I slipped down through the birches, determined at last to know that cry and stop guessing about it, if I had to follow it all night.

"The moon was high and full, the footing almost noiseless, and everything so quiet that I quickly located the clucking sounds as coming from the orchard. I came out of the birches into the wood road, and was crossing the open field to the orchard, when something dropped with a swish and a vicious clacking almost upon my head. I jumped from under my hat, almost — and saw the screech owl swoop softly up into the nearest apple tree. Instantly she turned toward me and uttered the gentle purring cluck that I had been guessing at so hard for at least three years. And even while I looked at her, I saw in the tree beyond, silhouetted against the moonlit sky, two round bunches — young owls evidently — which were the explanation of the calls. These two, and another young one, were found in the orchard the following day."[1]

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[1] From "The Lay of the Land."

BIRDS OF THE FIELDS

I HAVE not named all the birds that you will occasionally find nesting in the orchard, but only those that you will go naturally to the orchard to find. Now there are certain other birds that nest regularly in the open upland fields. These we will group as field birds, to distinguish them from those we shall find on farther in the low meadows and again from those of the brush lands.

Our object in all this study is to know the birds and animals by sight and sound, and more than that to know them in their accustomed place in the out-of-doors It is not a vesper sparrow that we are after first of all, but rather a field, an evening, a nest sunk in the ground beneath a weed, and a little bird with a white feather on each side of his tail, alighting with an ecstatic burst of song upon a fence stake.

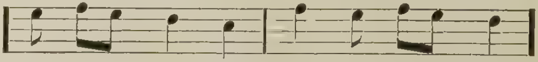
The Vesper Sparrow. The vesper sparrow loves old open fields, where it sinks its nest into the ground in the most hazardous of places. That it suffers terribly on this account no one can doubt. Early morning, late evening, and in fact all through the night you will hear his wild, sweet melody, a song not unlike the song sparrow's, but softer, sweeter, more plaintive. He has a habit of flitting before you and showing his white-bordered tail. He is a migrant, arriving early in April and staying until November.

The Field Sparrow. Instead of going on to the meadow, we shall turn off across the higher ground to the old upland pasture where the young cedars are now head high and look as if planted and spaced by some landscape gardener. We have not gone far before from the tip of one of these cedars a trilling little song trips over the quiet pasture — *chee-wee, chee-wee, chee-wee, chee-wee, chee-wee-e-e-e-e*, the string of little e's at the end trailing away with the sweetness of a melting bit of sugar. No other bird has this *sweet little falling, sinking* song. But notice his light, unstreaked breast, buffy ring about the eye, *flesh*-colored bill, and bright-brown back and wings. You will know him. You will seldom hear him after August.

The Meadow Lark. The most elegant bird of the fields is the meadow lark, whose domed nest is placed in the midst of a clump of clover or a tall bunch of herb grass.

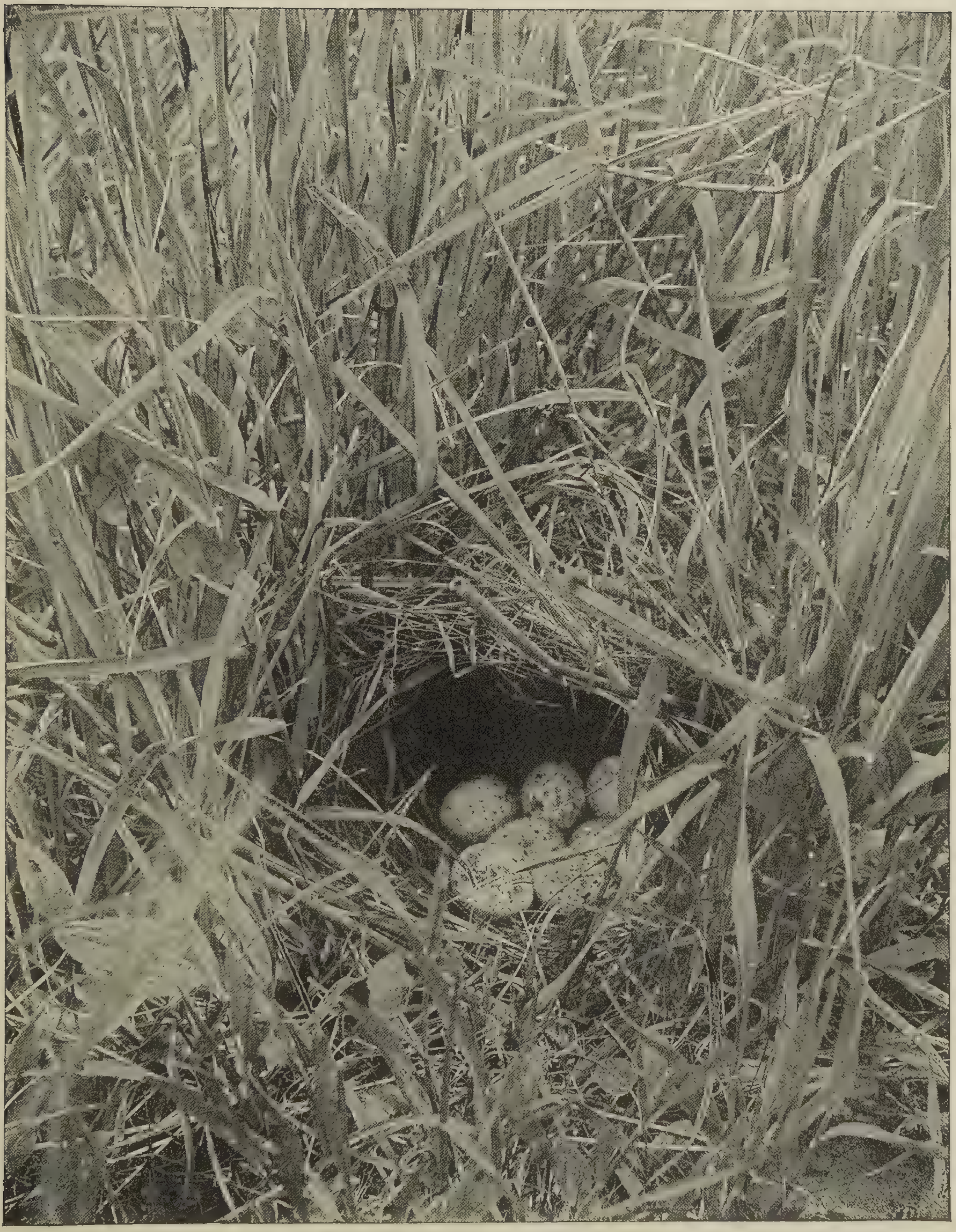
You may mistake the lark for a quail at first, until you catch sight of the white feathers each side of the tail; or you may think him a dickcissel, until you see his larger size.

They scale along the grass, rarely rising higher than the cedars, flapping rapidly for a short distance, then sailing a little in a cautious, breath-held manner, as though wings were a new invention and just a trifle dangerous yet. On they go to a fence stake, and land with many congratulatory flirts of wings and tail. Has anybody observed the feat? They look around. Yes; here I sit — a man on a fence across the field — and the lark turns toward me and calls out, "Did you see me?" which Dr. Chapman puts to music thus:



He would be the best-bred, most elegant of our birds, were it not for his self-consciousness. He is consumed with it. There is too much gold and jet on his breast. But, in spite of all this, the plain, rich back and wings, the slender legs, the long, delicate beak, the erect carriage, the important air, the sleek, refined appearance, compel us to put him down an aristocrat.

The Nighthawk. In a closely cropped pasture near the house, in early June, I found the eggs of the nighthawk. There was no nest, of course: the eggs were laid upon the bare grass, and might, except for the mere chance of having been placed partly under the fence, have been stepped on by any passing creature. The eggs are grayish, thickly mottled with varied tints of darker gray, slate, and yellowish-brown; the pattern and tints are very variable. The nighthawk, bull bat, or goatsucker, as it is variously called, breeds throughout its range, with scarcely ever a trace of a nest for the eggs. They are frequently deposited on bare rocks and on the flat roofs of buildings in large cities. The nighthawk and whip-poor-will are often confounded, or considered as birds of the same species. A careful comparison with each other, or with the descriptions, will at once show a very



THE DOME-SHAPED NEST OF THE MEADOW LARK

decided difference. In the evenings of summer months great troops of nighthawks may be seen high in air over forest or town in search of insects, performing their wonderful evolutions and uttering their peevish cries; or, swooping down with their strange booming or rumbling sound, they skim over the grassy meadows. Thus they continue till the gloaming merges into darkness and their flight is seen no longer.

The large white patches on the five outer primaries of the wings, when the bird is flying, appear like tattered holes caused by the shot from a gun.

This is one of the peculiar birds of the fields and sprout lands that we all should know. Over this nest in the pasture sat the mother *lengthwise* upon the top rail. She zigzagged off at my approach like a great bat, and the way she flew would make one think that she did not know the use of her wings. But what a circus flier she is at night! and with what an uncanny noise she haunts the twilight! She has made more hair stand on end, with her earthward plunge and its unearthly boom through the dusk, than all the owls together. It is a ghostly joke. And who would believe in the daylight that this limp, ragged lump, dozing upon the fence or the kitchen roof, could play the spook so cleverly in the dark?

The Whip-poor-will. Strictly speaking, the whip-poor-will is a bird of the sprout lands — the low "cut-offs," where the sunlight streams freely in. But I have also found them along the edges of brush land on the fences of the open fields. It is a species, however, which will not brook the growth of cities and becomes less common each year.

I have told of an adventure with Whip-poor-will in a chapter in "Wild Life near Home," but I must quote Mrs. Blanchan's happy account:

"Like his cousin, the nighthawk, and his more distant relatives, the humming bird and the swift, his feet are too small and weak for much perching. You never see him standing erect on a twig with his toes clasped around it, but always squatting when at rest.

"A narrow white band across his throat makes his depressed head look as if it had been separated from his body — a queer effect that may remind you of the Cheshire Cat in 'Alice in Wonderland.' The whip-poor-will's three outer tail feathers have white ends which help to distinguish him from the nighthawk. He has a funny little short beak, but his large mouth stretches from ear to ear, and when he flies low above the fields after sunset, this trap is kept open, like the swift's and the swallow's, to catch any night-flying insects — mosquitoes, June bugs, gnats, katydids, and little moths — that cross his path. Long, stiffened bristles at the ends of his mouth prevent the escape of a victim past the gaping trap. On the wing the bird is exceedingly swift and graceful. You might mistake him for a bat or a nighthawk.

"Relying upon the protective covering of her soft plumage, the mother whip-poor-will builds no nest, but lays a pair of mottled eggs directly on the ground in the dark woods where a carpet of dead leaves and decayed wood makes concealment perfect. Not even the ovenbird contrives that a peep at her eggs shall be so difficult for us. It is next to impossible to find them. Unlike the wicked cowbird, who builds no nest because she has no maternal instinct, the whip-poor-will, who is a devoted mother, makes none because none is needed. Once I happened upon two fuzzy, dark, yellowish-gray, baby whip-poor-wills (mostly mouths) in a hollow of a decayed, lichen-covered log, which was their 'comfy' cradle; but the frantic mother, who flopped and tumbled about on the ground around them, whining like a puppy, sent me running away from sheer pity.

"In the Southern states a somewhat larger whip-poor-will, but with the same habits, is known as chuck-will's-widow."[1]

The echoing song of "*chuck* whip-poor-will" — loud and repeated by the beat of the second — is known to everyone who has seen the summer sun go down behind the open fields.

The Cowbird. Where shall we place the cowbird? He has no nesting place, since his mate steals into lesser birds' nests and drops into them her foundlings. You will find her eggs in the vireo's nest and the various sparrows' nests; but the bird itself you oftenest see in the pastures where the cattle are feeding.

As a rule, the cowbirds are first observed in the spring about March. They come singly

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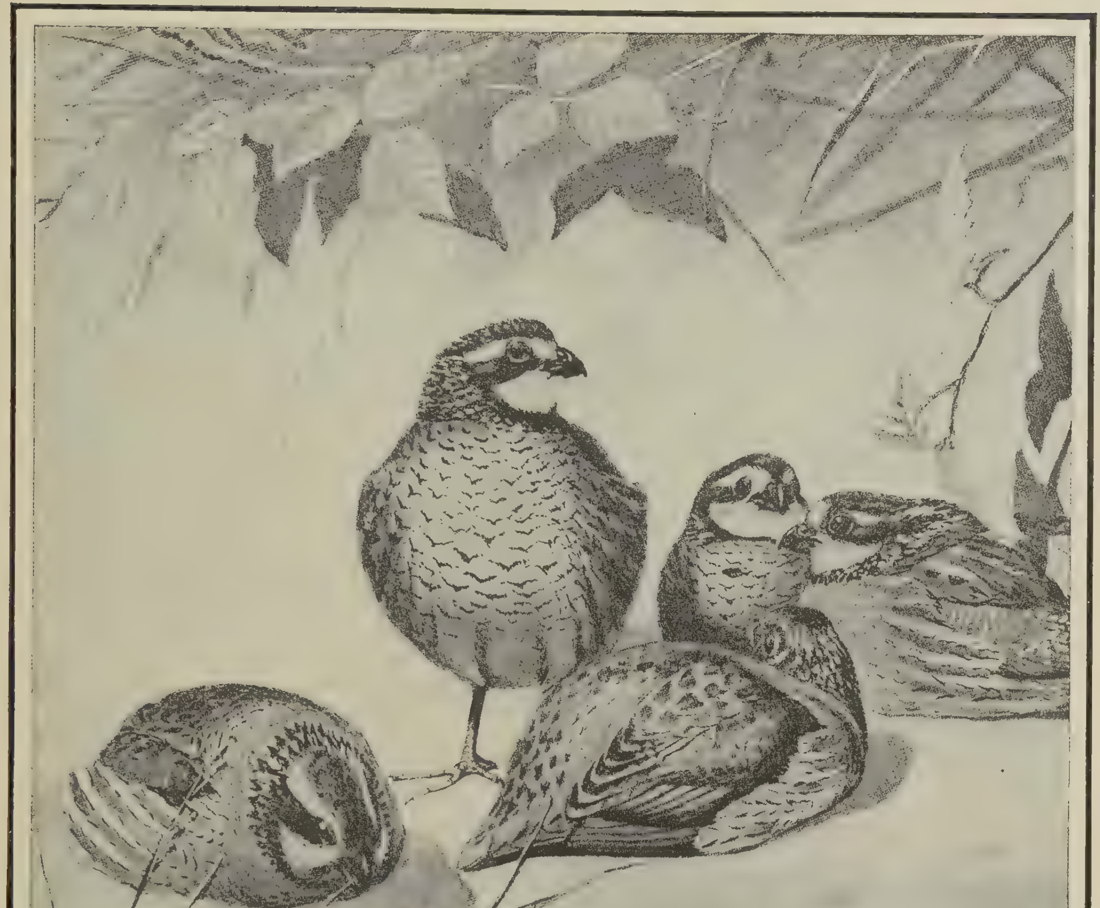
[1] From "Birds Every Child Should Know."



BOB WHITE, OR QUAIL (*Colinus virginianus*)

One of the farmer's greatest helps in the extermination of insects. Drawing by Ernest Thompson Seton. From Stickney's "Bird World." By permission of Ginn & Co.

or in small bands. The male may be seen perched in an exposed position on a tree top, calling his long-drawn-out, glassy *kluck, tsē-ē-ē.* "Later, when wooing the female, he utters a curious, gurgling note, resembling the sound made by pouring water rapidly from a bottle, and accompanying it by motions which suggest extreme nausea." Few birds seem aware of the imposture, and not only do they incubate the egg but may attend to the demands of the young cowbird at the expense of their own offspring, who sometimes die of starvation. Even after leaving the nest the young parasite continues its call for food, and one is surprised, when seeing a Maryland yellowthroat or some other bird feeding a clumsy fledgling twice its size, that the foster parent does not detect the deception. The cowbird is a thoroughly contemptible creature, lacking in every moral and maternal instinct, compared with the bird who constructs a well-made nest, faithfully broods her eggs, and cares for her young with a devotion of which mother love alone is capable.[1]

The Killdeer. I never hear now his ringing, plaintive cry about the stony fields here in New England; but when I was a boy, from the time of early spring to late fall, I never remember being out of range of the killdeer cry. The meadow lark frequented the rich upland meadows and mown fields, and the killdeer the washed-out, stony, fallow fields where not a blade of grass grew to hide him!

The killdeer always builds in a worn-out pebbly pasture or in a bare, unused field. Here, among the stones, she makes her nest by scraping out a shallow cavity, in which she places a few bits of rotten wood and weed stalks in sizes fit for the plastering of a caddis worm's house. Often, instead of digging a cavity, she hunts up two or three stones and a corn butt or any objects which happen to lie together so that in between them she can put her eggs — eggs that for matched coloring with the stones are one of the world's small wonders. You will step on them forty times before you will see a set of them — right under your feet.

Her nest is on a bare knot, where she can see all who enter the field. You will step upon her almost before she will flap off limping with dragging leg and broken wing. You will follow to try to pick her up, but she just manages to flutter beyond your fingers till she has led you out into the field far from the nest, when, presto! — she is on the wing with her ringing cry and is gone, the fakir!

Bob White. What other bird of the fields holds the place in our affections that Bob White holds? And what other birds do we persecute so relentlessly? Perhaps it is not generally known that the game hunter is rapidly destroying the quail throughout the country. Already they have been nearly extirpated here in New England. They are imported and liberated here. They bring off their large broods the first summer, but by springtime hardly a quail of them all is left.

One has been calling this summer in the fields — *one* after years of silence — *one* when twelve years ago a nest of them hatched within fifty yards of the house.

"The mating season is scarcely over, the young not yet grown, when the gunners about me go into the fields with their dogs and locate every covey of quail, even counting the number of birds in each. With the dawn of the first day of open season they are out, going from flock to flock, killing, till the last possible bird is in their bloody bags.

"One of the most pathetic of all the wordless cries of the out-of-doors is the covey call of the female quail at night, trying to gather the scattered flock together after the dogs are called off and the hunters have gone home.

"It was nearly dark one December afternoon, the snow ankle-deep and falling swiftly, when, crossing a wide field, I heard this call from a piece of sprout land ahead of me. Kneeling in the snow, I answered the whistle. Instantly came a reply. Back and forth we signaled till there was a whir of wings, and down in the soft snow within a few feet of me dropped the lonely, frightened quail. She was the only one left of a covey that the night before had roosted unbroken, snugly wedged, their tails together under a pile of brush. This is the story everywhere, except in Ohio, where they are protected as songsters and are therefore relatively abundant."[2]

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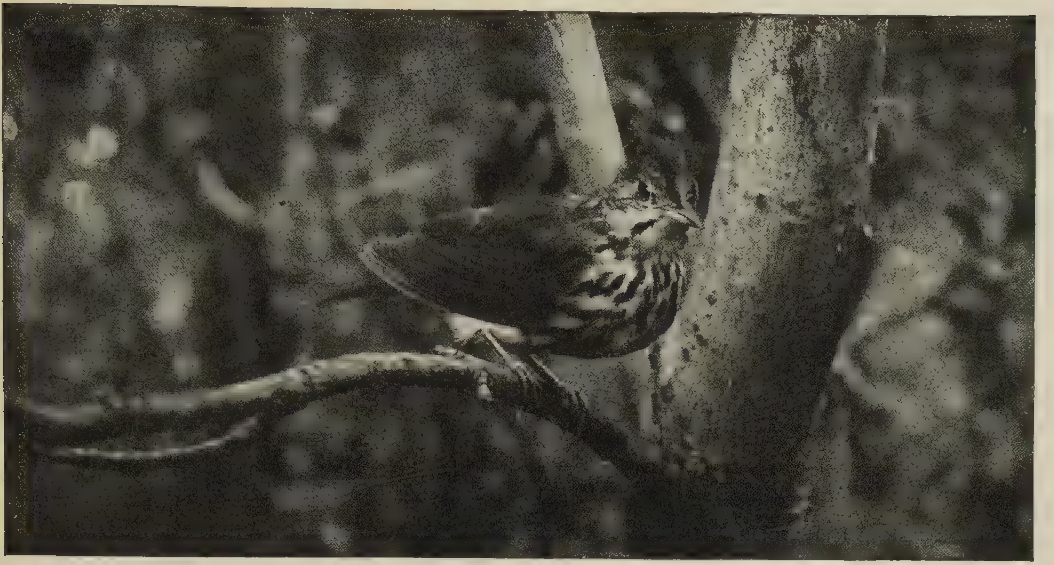
[1] Dr. Herbert Friedman has written a remarkable book on the cowbirds.

[2] From "Wild Life near Home."



THE OVENBIRD (*Seiurus aurocapillus*)

His song of "Teacher, *Teacher*, TEACHER, TEACHER, *TEACHER!*" is known to all who frequent the woods.

BIRDS OF THE BRUSH AND WOODLANDS

A SCIENTIFIC arrangement of this book would call for the birds in the order of their families, of which there are sixty-one, beginning with the grebes, among the diving birds, and passing on through the swimmers, waders, gallinaceous birds (the quails), pigeons, birds of prey, to the great order of perching birds, to finish with the thrush family. That is impossible in a book of the scope and purpose of the present work. There are plenty of such books for every section of North America. This volume, if it sends you seeking the scientific manuals for more knowledge of the birds, has accomplished all that it is intended to do. No, not all, for I hope that it will also give you pleasure as you read.

As the largest order of birds is the *Passeres*, or perching birds, so the most abundant fields for bird study, among the tramps we can take, are the woodlands. As you enter the low sprout land from the high pastures or low, level meadows, you pass again into a new bird world.

The cut-over or sprout land, if bordering cultivated fields, is especially rich in bird life. Here you are met at the very fence by the brown thrasher, the catbird, the ovenbird, the chewink, and the red-eyed vireo.

The Catbird. It will be hard to explain why it is that the catbird, brown thrasher, and wrens are all in one family, while the thrushes and robins and bluebirds are in another. It is largely a matter of *scales* on the leg.

But it is not scales or boots now. We want to know the *long, slender, slate-colored* (all over) catbird. It has a blackish cap and chestnut undertail coverts. It is common everywhere and will meet you in nesting season with a *mew* very much like a cat's. But listen some spring morning to its varied and imitative song. It is not so good and full as that of either of its famous brothers — the thrasher and the mocking bird — but it rightly belongs to the trio that make up the most wonderful singing-bird family that we have. Its nest is placed in hedges or thickets, made of twigs, rootlets, and grass, lined with fine black roots; the four eggs are plain greenish-blue.

The Brown Thrasher. The catbird shows a decided preference for the vicinity of water, while the thrasher takes to the higher sprout land. Both birds are nesting on my hillside this summer, but the catbird down near the brook. The largest, slenderest, *bright* brown that flits through the low bushes, scolding you with a peculiarly soft *smack*, or that sings like the angels from the tiptop twig of the tallest tree, is the brown thrasher. This is the very best bird singer that I know, and I have listened to the mocking bird too. The thrasher is the grand-opera singer among the birds, and withal one of the most beautiful, too, in spite of his love for strawberries. I plant enough to go round. (It is different with the cherries, though. He gets them all.)

Don't mistake the long-tailed brown thrasher for a thrush because he has a rusty back and a speckled white breast. Spots are not an exclusive thrush characteristic. The ovenbird and some of the sparrow tribe have speckled and streaked breasts. The brown thrasher is considerably larger than a thrush and his habits are quite different.

Like the catbird, the brown thrasher lives in bushy thickets overgrown with vines, where, running over the ground among the fallen leaves, he picks up with his long, slender bill the insects that, but for him, would soon find their way to the garden.

His nest is of twigs and rootlets, in hedges, thickets, or thorn bushes; the four or five eggs are bluish-white with numerous fine dots of reddish-brown over the entire surface.

The Mocking Bird. I know that the "Solid South" will be against me when I say that the brown thrasher is a better singer than the mocking bird. So will all of you, I fear, for from romance and song you have heard the latter's praises chanted. But I am not going to waste a line in argument over it, and perhaps often it is a case of sour grapes. I don't have the mocking birds here in the orchards and brush lands of Massachusetts, and I *do* have the thrashers. It is interesting to know, however, that a pair of mocking birds wandered into Massachusetts one recent summer and brought off a brood of young in the dooryard of Mr. F. H. Allen in Brookline.

The mocker hardly mocks — it sings, sings its own song, in its own way — hopping and fluttering from twig to twig and into the air. Many of the notes of the song, however, are identical with or similar to those of other birds. Hence the name.

It loves dooryards and city parks, and in the nesting season sings, like the European nightingale (only a great deal better!), during the night.

The nest is made of small twigs lined with roots and horsehair and cotton. Various situations are selected for the nest — thick brambles, an orange tree or holly bush, clumps of live oak scattered over the prairies in the southwest, as well as brush piles and corners of rail fences — but never is it made on the ground.

Its colors are gray and white, and with all its habits it is very much like its cousin the catbird.

The Towhee or Chewink. Now that we have disposed of the celebrities, let us take some polite notice of the less distinguished folk of the "cut-offs."

If you hear a violent scratching in the *early* spring, like an old hen with a brood of chicks, put it down for a fox sparrow; but if you hear the scratching in the summer you will know a chewink is under the bushes ahead. He is the best scratcher for grubs, that I know; and you always find him in the low bush lands where, under a pile of "slashings," it may be he has hidden his nest. *Please* try to find *one* towhee's nest during the next twenty-five years!

He comes along in the end of April and stays till November. But he is also a singer, and likes the tiptop of a tree, as the thrasher does, in the early morning or evening, where he pours out a simple rich song with a rising, drawn-out end — *I will sing!* His call is a quick, sharp *chewink!*

The nest is placed on the ground and is composed of strips of bark, grass, and leaves; eggs, white with reddish-brown dots over the whole surface.

The chewink is about the size of a robin and is often called the "ground robin." It is a bird of swamps, brushy pastures, and open woodlands. The male, with his black, white, and brown clothes, makes a conspicuous object, while the female, with her brown and white dress, harmonizes with the leaves so that it is difficult to see her.

The Two Cuckoos. Do you know the soft *cow-cow-cow* call of the yellow-billed cuckoo?

"Rain crow" he is called, because on cloudy summer days there is something so hollow, far-off, and haunting that it sounds like a prophecy and, as the thing we most want in the hot summer is rain — why that, of course, is what the cuckoo is prophesying will come.

This to me is the most interesting bird of the woods. In "Beyond the Pasture Bars" you will find a chapter in which I tell how closely the cuckoo is connected with my own knowledge and love of birds — how old Professor Jenks, turning inside out the gizzard of one I had shot, showed me that "my enemy," as I thought him, had been eating hairy caterpillars, the lining of its gizzard being stuck quite full of the barbed hairs of the "woolly bear" caterpillar.

"There is always something strange and interesting about the ways of cuckoos, even when they are not parasitic on other birds; their note or their feeding habits are strange. The 'crow pheasant' (roadrunner) will eat toads, which, like hairy caterpillars, are creatures that few birds will touch.

"The American cuckoo builds a flimsy nest of twigs, very much like that of a dove, and lays blue eggs. These eggs are laid at such long intervals that, as the old bird begins sitting at once, some of the young are hatched out long before the others, so that the brood are of various ages and there may even be eggs and well-grown young in the nest at the same time. Here again is a cuckoo custom which is strange; for though some other birds, such as the barn owl, also bring up their family in this straggling way instead of waiting till they have a full set of eggs and hatching them all at once, the custom is not a common one in the bird world, as everyone knows who has been bird-nesting."[1]

The yellow-billed species is most abundant in the southern part of its range, while the black-billed is the most common in the North. Notice that the lower mandible is yellowish, that the wings are largely rufous, and that the outer tail feathers are black, with broad white tips in the yellow-billed, these points readily distinguishing it from the black-billed. The eggs of this species are large and paler colored than those of the black-billed.

Neither of our cuckoos are the renegade parents that the English cuckoos are, but otherwise are very much like them.

The Cardinal. No one can describe the thrill of the whistle of the cardinal and the flash of his brilliant feathers in the snow-buried thickets on a wintry hillside! I used to trap them when a boy — and they used to bite me.

The cardinal is about the size of a towhee, with a black throat, and body almost wholly rosy red. In spite of these flaming colors the cardinal is a surprisingly difficult bird to see. You may often hear his sharp *tsip* without catching a glimpse of him, so well can he hide in the copse. His olive-brown mate is like his lord in shape and crest only.

A "rich, sympathetic" whistle is Dr. Chapman's description of the song. "His mate also sings at times, and I carry in my memory a musical courting I once observed," he says, "in which a pair of these beautiful birds were the actors. The song begins with *whee-you, whee-you,* long-drawn notes, which are followed by a more rapid *hurry, hurry, hurry; quick, quick, quick,* and other notes difficult of description." The cardinal is rarely seen north of New York City. It is, however, a permanent resident throughout its range, and one of the birds that I always knew, as a boy, in New Jersey.

The nest is about four or five feet from the ground in thickets. The cardinal lays three or four eggs, which are white or bluish white, speckled and spotted with grayish or reddish brown.

The Turtle Dove or Mourning Dove. Just up the road from the house, in a small oak tree and placed a little out of my reach, was the nest of a pair of turtle doves. You could see the eggs through the loose platform of sticks — two white eggs about the size of a pigeon's. Now the family of four feeds daily in my mowing field, — all beautiful chocolate-brown, dove-colored rather, with iridescent backs and sides. They spread their long tails as they fly up and go off on *whistling* wings. You will take them for pigeons, and you will hear their wings as you can hear no other set of wings — a mark that will identify the bird for you.

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[1] "Talks about Birds," by Frank Finn.

Only two of this family have been found in the Eastern states — the passenger pigeon, now exterminated, and the turtle dove. In the Far West you have the band-tailed pigeon and in the South the smaller ground dove, but in habits they are all very much alike, our Eastern turtle dove being the best known.

> "It was only a seed that fell,
> A downy and tiny seed;
> And few that saw it could tell
> What an evil and pestilent weed
> Would spring from that little sphere,
> With power to spread at the root
> Till it choked out all blossoms of cheer,
> And cut off all promise of fruit."

An Audubon Societies leaflet has this to say of the turtle dove:

"Is there a farmer in the country who, after a hard day's work with hoe or cultivator, has not wished that some other means could be devised to prevent the rapid growth of noxious weeds, and at the same time emancipate him from the sweating brow, the blistered hands, and aching back?

"There is one means of weed destroying that has been entirely overlooked by the agriculturists, probably because they never seriously considered the food habits of the dove.

"Recent investigations of the food of the dove prove this bird to be of incalculable value. The examination of the contents of 237 stomachs of the dove shows that over ninety-nine per cent of its food consists wholly of vegetable matter in the shape of seeds, less than one per cent being animal food.

"The principal and almost constant diet, however, is the seeds of weeds. These are eaten at all seasons of the year. They constitute sixty-four per cent of the annual food supply, and show very little variation during any month. Some of the seeds eaten were so minute it would seem that none but the smallest species of birds would eat them, and then only when driven to do so by lack of other food. Some instances of the enormous numbers of seeds that individual birds consumed will be of interest. In one stomach were found 7500 seeds of the yellow wood sorrel (*Oxalis stricta*), in another 6400 seeds of barn grass or fox-tail (*Chactocloa*), and a third had eaten the following combination:

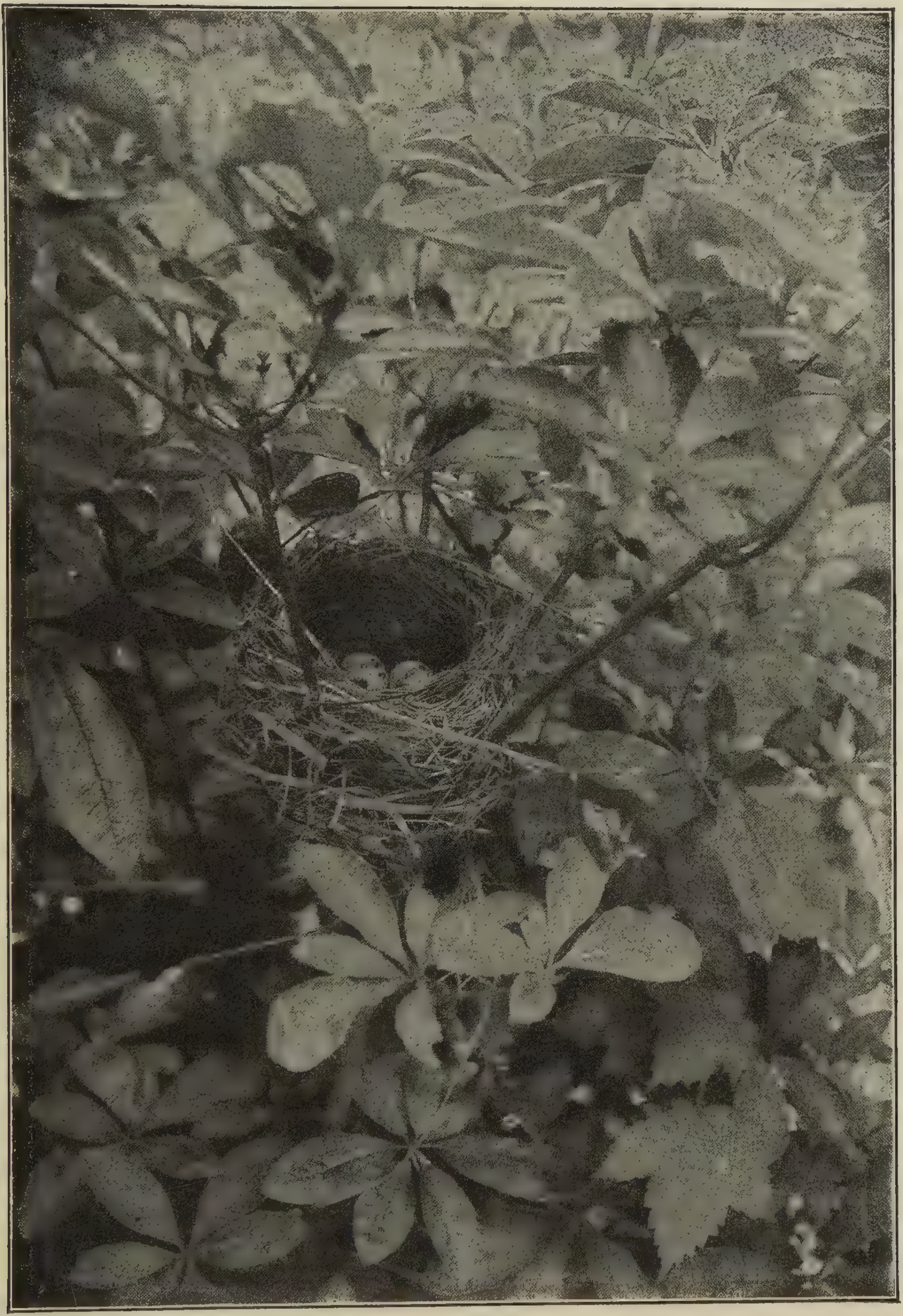
Slender paspalum	2600	seeds
Orange hawkweed	4820	"
Hoary vervain	950	"
Carolina cranesbill	120	"
Yellow wood sorrel	50	"
Panicum	620	"
Other weeds of various kinds .	40	"
Total	9200	"

"None of the above are useful plants, and most of them are noxious weeds, especially the first two.

"The three doves in question benefited the farmers, on whose land they fed, by destroying 23,100 prospective weeds.

"In many sections of the country this valuable, harmless, and gentle creature is considered as a semi-game bird, and is shot during a large part of the year. It is a question for the farmers to settle whether they will permit anyone to kill on their land birds that annually destroy tons of the seeds of pigeon grass, ragweed, smartweed, bindweed, and many other noxious plants, and are thus worth so much as helpers on farms. The matter resolves itself into a question of figures, *i. e.*, dollars and cents to the farmers. If three doves at one meal destroy 23,100 weed seeds, and thus prevent the growth of the same number of prospective weeds, how much good will all the doves on a farm or in a state, or in the country at large, accomplish?

"Or, to present the case in another way, how much will it cost in time, labor, and actual cash, to destroy what the doves will eat if they are protected and encouraged to remain on the farms? The farmers in the United States spend several hundred million dollars a year for labor; how much of this is paid for killing weeds, and how much of it could have been saved if no doves had been killed but all had been protected and permitted to perform the work that the Creator designed them to do? The dove is far too valuable an auxiliary to the agriculturists to have it classed as a game bird. Its value consists in its weed-destroying activities, and not in the few ounces of food it may furnish if shot as a game bird. I trust



NEST AND EGGS OF CHESTNUT-SIDED WARBLER

Nest built in azalea bush, two feet from ground.

the time is near at hand when the farmers of the country will protect the dove as carefully as they do their domestic fowls and animals."

The Warblers. Here in the scrubby sprout land you will find many of the warblers — a family of dainty little worm eaters, all of which are migratory, and *all* of which I don't suppose that I shall ever know by sight. Some of them are rare and difficult to find, as they only halt in passing back and forth.

Among the more familiar are the black and white warbler, the blackest and whitest, *most streaked* little bird in the woods, with a nest in the ground and feet made for running up and down the trunks of trees like the woodpeckers and brown creepers.

Because he calls a few thin, wiry notes — *zee-zee-zee-zee* — you may know that he is no woodpecker. Woodpeckers have thickset bodies and wear red in their caps, and all have stouter bills than the warblers. No woodpecker is so small as this streaked and speckled little creature. You could not confuse him with the placid brown creeper or with the slate-blue nuthatch, which also creeps along the branches on the under or upper side.

The Prothonotary Warbler has the whole head and under parts intense yellow, almost orange on the head of the male; tail with white spots near the tip. This is a common bird in the interior, found in bushy swamps and the willows around the borders of pools and lakes, where, with the tree swallows and chickadees, they build in holes in hollow stubs along the bank, being one of the few members of this family that makes use of such locations for their nests.

The Worm-eating Warbler has a buffy crown with two black stripes; back, wings, and tail olive-green, with no white markings; below buffy white.

These are very unsuspicious little birds and easy to approach, spending the greater portion of their time on or near the ground catching spiders and other small things. They also glean part of their living from the under side of the foliage, much as do the vireos. They are met with in open woods and brush-grown pastures.

Their nests are placed on the ground in depressions under logs, stones, or bushes, and are made of leaves and grass, lined with fine grass or hair; the eggs are four or five in number, white, spotted principally around the large end with brown.

Here in the bushes are found also the blue-winged warbler, Nashville warbler, orange-crowned warbler, and golden-winged warbler.

The Yellow Warbler. Everybody knows the "yellowbird," for it often comes out of the brush into the orchard.

The yellow warbler has chestnut streaks on the sides; female, duller and without the streaks, but no black wings like the goldfinch. It is a bird found nearly everywhere, in woodland, park, orchard, or garden, and one of the most vivacious of the family. It arrives in the North soon after May 1, and is seen flitting about like a gleam of sunshine snatching insects from the foliage or darting after them in the air. It is often known as the "summer yellowbird," and it frequently nests in garden or orchard trees, where it is a most welcome tenant. The song is a sharp, vigorous *che-wee, che-wee, che-wee*, and the nest a beautiful and compact structure of vegetable or plant fibers firmly quilted together and fastened to upright forks of bushes or trees at low elevations. Willows along creeks, ponds, or rivers are favorite resorts.

The Chestnut-sided Warbler is one of the most common warblers. He has a yellow crown, black line through the eye and on side of the throat, and a broad chestnut stripe on the sides; the female is paler and with less chestnut; the young are greenish-yellow above and with no chestnut.

Nearly every swamp or bush-covered pasture within their range shelters one or more pairs of these warblers. While they sometimes feed in the tree tops, they are birds of the lower foliage and are usually seen in low bushes. They sing two songs, one like that of the yellow warbler but always ending in a phrase like *wee-choo*, the other an insignificant warble without such an ending.

It is impossible to note more of the warblers here. You will need to get Dr. Chapman's excellent book on this group if you want to know them accurately. But there are two other interesting members of the warbler family to be found in the scrubby woodland, that must be mentioned here: and the first of these is the ovenbird.

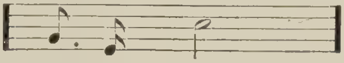
The Ovenbird. His crown of orange-brown bordered by black is a distinctive mark. He loves the woods, where he builds his arched nest on the ground among the leaves or pine needles — a peculiar, ovenlike construction. He is a ground bird, only mounting to the lower branches of trees to sing or when scolding an intruder. The song is a peculiar ascending song resembling the word "teacher," repeated five or six times and gathering strength and volume with each syllable; call, a sharp *chip*. He has a habit of singing on the wing toward dusk a different song which Thoreau called that of the night warbler, never knowing it to be the ovenbird's song.

The Yellow-breasted Chat. This bird is the other peculiar fellow. He is the largest of the warblers — seven and one-half inches long — about the size of a bluebird, breast yellow, lores black, line over the eye, and under parts white; no white on wings or tail.

Dry side hills and ravines covered with thick underbrush are the places to look for chats. Usually if they are present they will make themselves heard long before you see them. They are mimics of the highest order and can make any kind of whistle or squawk, but all their vocal efforts seem to require a great deal of flirting of the tail and twisting of the head.

"Now he barks like a puppy, then quacks like a duck, then rattles like a kingfisher, then squalls like a fox, then caws like a crow, then mews like a cat—*C-r-r-r-r-whrr*—that's it—*Chee-quack*, *cluck*, *yit-yit-yit-now*—hit it—*tr-r-r-wheu-caw-caw-cut*, *cut-tea-boy-who*, *who*, *mew*, *mew*," writes John Burroughs. "The zany at the circus can go through no more clownish tricks than the chat. See him, a mere bunch of feathers, dance and balance in the air, now fluttering, now falling as if he had been shot, or turning aërial somersaults, now rising and trailing his legs behind him like a stork, now dropping out of sight in the thickest part of the thicket. The instant he spies you, *chut-chut*, he scolds from the briers."[1]

The Wood Thrush. *Two* more did I say? Why, there are two dozen more, and among them such wonderful singers as the wood thrush, he of the *big*, *round* spots on the breast, with the pure heavenly *Come-to-me* song, the most truly spiritual note in all the woods:



The Ruffed Grouse. Another is the ruffed grouse, the spring drummer, a royal bird, indeed, but destined to go the way of many another splendid game bird because of the growth of cities and the growing use of the automobile by hunters.

The Blue Jay. Here, too, we find the blue jay. Her favorite nesting place in my woods is out on the flat limb of a small pine tree, or up in the thick top of young oaks or maples.

BLUE JAY ON HER NEST OF STICKS

THE TALL TIMBER

WITH the jays we pass into the tall timber. While we are about it let me stop for a moment and deal with the whole crow crowd.

THE CROW CROWD

I should have written for this title "The Crow Family," but I have just come up from my garden, where I found every sprout of my "Golden Dawn" sweet corn pulled up and the kernels of corn from which they sprouted eaten — by the crows! The rascals! I heard them cawing hilariously in the woods this morning. I knew something was up — my corn was up — by the roots at that!

There are twenty-five members of the crow family in North America, only five or six of which the average reader of this book will ever see; namely, the crow, the blue jay, the magpie, the raven, the whisky jack or Canada jay, the fish crow of the shore and the California jay.

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[1] "Birds Every Child Should Know."

They are all strong, bold birds, but wiser than bold, as all birds ought to be. The wisest of all the things that fly is an old crow — the craftiest, most annoying sinner in feathers, I think. He eats my young chickens, robs my catbirds' and thrashers' nests, steals my corn, and plugs my watermelons.

But who has ever reckoned up the amount of good he may do by destroying grubs and other noxious things? All things considered, Jim Crow is a friend and deserves protection.

The Fish Crow. Along the Southern Atlantic seaboard is a smaller crow that talks through its nose — the fish crow. It is not so generally distributed over the country as our common crow, rarely reaching Connecticut.

Clark's Crow. In Oregon, away up on the wooded sides of Mt. Hood, I watched the rarest of all our crows — a gray-white and darkish bird. It is named after its discoverer, Clark's crow, for it was Clark of the Lewis and Clark expedition into the then unknown Northwest who first reported this interesting bird that is so tame as almost to settle at one's feet when crumbs are thrown out to it from the table of Cloud Cap Inn, where the climb begins to the summit of Mt. Hood.

The Blue Jay, Whisky Jack, and Others. Each one of us, to the four corners of the country, has his own jay — the common blue jay in New England; in California, the California jay, a different bird but still a jay; whereas in Florida you have a Florida jay, in Canada a Canada jay, in Oregon the Stellar's jay — all different, all individual and striking persons of the bird world.

I was tremendously interested in the Canada jays or moose birds or whisky jacks or "camp robbers," as you may choose to call them, that visited our camp in the Joseph Mountains. It was a wild region, and these curious and inquisitive jays would light on the tops of the trees around and call to us, then come down near the fire to see what scraps of food they might find.

Their nesting habits are all much alike, and much like the crows', only on a smaller scale. They are all thieving, cunning birds, that not only brighten the landscape with their lovely plumage and call in the naked woods of autumn when the other birds have gone, but also befriend us by killing great numbers of insects.

MY FIRST RAVEN

The Raven. I have haunted the woods all my life, but it was not until within a few years that I saw my first raven. It was a thrilling moment. I was standing on the rear platform of a train winding slowly up the wild Des Chutes River canyon in Oregon. The towering cliffs and rounded peaks looked far down upon me, and away beneath rushed the boiling crystal river. Suddenly as the train bent about a projecting rock, a sheer wall of cliffs rose over us and off from one of their shelves sailed a great black bird. He was so far up that I thought it must be a crow; but out he sailed over the river and then I saw the big nest on the ledge, and knew him for what he was — the raven — wise, powerful, splendid creature!

I saw others in the rim rocks of the desert in southeastern Oregon, and had two of them in my hands. He has gone from most civilized neighborhoods, but long may he have these

wild rocks for his aerie and this vast Western desert land for his realm.

THE RAVEN'S HABITS — HIS CALLS

"In January," says an English naturalist, "when the old birds began to repair their nest; in February, when the eggs were laid; in March, when the young birds were hatched; and in April, when, already dressed in their complete and final plumage, they were beginning to find their wings — I was able, from time to time, to watch the progress made, and put to the proof the solicitude of the parent birds for each other and for their young, to admire their aërial movements, and to listen to the curiously varied intonations of their deep-voiced throats.

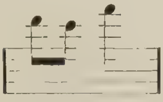
"He has quite enough varieties to his voice — his croak, his bark, his grunt, his chuckle — to attract the ear and call for close attention. There are few birds whose movements are so varied and so graceful, especially when the nest is preparing and the cares of motherhood have not yet begun."

The Magpie. The magpie is, with the one exception of the jay, the most striking in color and the most graceful in form of all the members of the crow tribe.

Like the crow and the raven the magpie is a very wise and knowing bird. I have watched them along the margins of Klamath River, where their immense nests fill the short willows, and I can think of nothing that would add more to my out-of-door world here in New England than a pair of these splendid birds nesting here with their cousins, the blue jays, in my meadow trees.

But how deep in the *woods* we are getting! I must get out — quick, or we shall never come to the end of this book. Yet the woods are full of birds — hawks, owls, especially the red-tailed and the red-shouldered hawks, and the barred owl, whose story I have told in "Wild Life near Home." Here, too, are the woodpeckers — the downy and the red-headed and the hairy woodpeckers. But I can stop only for two or three birds more.

The Wood Pewee. This is a wood bird, loving the tall oak and chestnut woods where in the shadows of the early summer you will hear his sweet notes, falling as softly as a leaf shadow falls from somewhere high over your head. He is named for his call — *pewee* — an inexpressibly tender note. You can tell it from the phœbe's by its softness, and from the *phœbe* call of the chickadee by its sadness.



They build their little moss-covered homes on horizontal boughs at quite a height from the ground. Their nests are among the most exquisite of bird creations, composed of plant fibers quilted together and ornamented with rock lichens, situated at varying heights on horizontal limbs, preferably oak or chestnut, and sometimes in apple trees in orchards. The eggs are creamy white, specked with brown.

> "With greenish-gold its vest was fringed,
> Its tiny cap was ebon-tinged,
> With ivory pale its wings were barred,
> And its dark eyes were tender starred.
> 'Dear bird,' I said, 'what is thy name?'
> And thrice the mournful answer came,
> So faint and far, and yet so near —
> 'Pewee! pe-wee! peer!' "

The Rose-breasted Grosbeak and the Scarlet Tanager. Here we are, too, in the home place of the splendid rose-breasted grosbeak and the scarlet tanager, that together with our bluebird and cardinal grosbeak give us the tropics here in temperate North America.

STILL IN THE WOODS

We are not out of the woods yet, for here are the chickadee (dearest of birds) and the great turkey vulture (most useful but ghostliest of birds), and a round score of others that you will scold me for leaving out. You will find a whole chapter devoted to the turkey vulture in "Wild Life near Home," and another in "The Lay of the Land," where also you will find a chapter in honor of the chickadee. Here also are the terrible little shrikes that impale smaller birds and insects, and even the mice and shrews, on long thorns.

But the list of the woods must close, for we want to get out into the open again, this time into the meadows.

"THE FRESH MEADOW ALONG THE CREEK OR RIVER"

BIRDS OF THE MEADOWS

IT is very interesting to note how restricted certain birds are to certain kinds of country — as if the land had been divided among them as the Promised Land was assigned to the children of Israel. You go to the woods for the hawks; to the swamps for the rails and herons; to the upland for the field sparrow; to the meadow for the bobolink, and there you will always find him.

As the fresh meadow and the salt marsh differ in aspect, so their bird life differs. One of the joys of bird study is the great variety of trips you can make—as different as the variety of countries you can visit in a tour of Europe.

But now to the fresh meadow along the creek or river or where the brook runs down from the hills.

Bobolink, Rice Bird, Reed Bird. Here you are on the lookout for bobolink, and if he is here at all you cannot fail to see him and — what is even better — to hear him. Have we any other singer so celebrated? Yet he is not any great artist. It is not his song, but his *voice!* It is the most bubbling, liquid, jeweled voice in all the world.

Long before I knew bobolink as bobolink I knew him as reed bird; for as a child I lived near the wide marshes along the Maurice River, New Jersey, where the migrating bobolinks halted by thousands on their way south to feed in the tall reeds on the river flats. Here we shot them in untold numbers and from here on to the rice fields of the South, where they do great damage, they were shot all the way.

He looked anything but his buff and black self then. Instead he was gray-brown like a sparrow. On his return in the spring he brings a new Brazilian suit (black and buff), over which is worn a kind of linen duster in the shape of a fringe on the feathers that is gradually worn off, so that by the time he reaches our Northern meadows we have our familiar bobolink again, full of song. And such a song! Mrs. Blanchan thus describes it and the singer:

"Loud, clear, strong, full of queer kinks and twists that could not possibly be written down in our musical scale, the rippling, reckless music seems to keep his wings in motion as well as his throat; for when it suddenly bursts forth, up he shoots into the air like a skylark, and paddles himself along with just the tips of his wings while it is the 'mad music' that seemingly propels him: then he drops with his song into the grass again. Frequently he pours out his hilarious melody while swaying on the slender stems of the grasses, propped by the stiff, pointed feathers of his tail."

Bobolink's annual journey is one of the most wonderful trips any creature takes — from Labrador to Brazil. But we shall speak of that later.

THE SONG SPARROW'S GRASSY CRADLE

The Red-winged Blackbird. The bobolink and the cowbird, the red-winged blackbird, meadow lark and oriole and grackle, all belong to the same family, the oriole being the only one of the tribe that does not flock.

They are a brilliant lot for the most part, and certainly the red-winged blackbird is as elegant as any of the family. Jet-black, with his scarlet and buff epaulets, where is there another bird with so much of distinction to his dress? And as for his song, unless you have heard him in early spring along some meadow stream, you can have no idea of the music in his bubbling *kong-quer-ree!* If a crystal spring were bubbling through a silver fountain and splashing over into a beryl basin and you could hear the music it might make, you would then have an approach to the rich, liquid song of the redwing.

Blackbirds may be found during the breeding season in almost any swampy place where there is a river or pond near by. In the neighborhood of New Jersey they begin nesting about the first week in May, and lay two sets of eggs, the second set being laid toward the end of June. I have found these nests in a wild rose-bush, hung over and within twenty-one inches of the water, resembling in construction the nest of the orchard oriole, but much more roughly made. The female bird is colored like a sparrow.

The Song Sparrow. Not so far into the meadow, along the bushes, the fences, or near the stream, you will find the song sparrow — first songster of the spring.

We have already seen three or four members of this great finch family — the largest of our bird families, containing almost six hundred species and found in all parts of the world except the Australian region. Notice their strong bills for seed eating. Get out early this spring, and above all things hear the song sparrow from the top of an old fence stake. It may be a cold February day. No matter. If he is there he will sing. It is not so much the song as it is the spirit behind it. Yet the song is very pleasing and musical, strongly resembling the brilliant measures of the canary.

They are probably the best known, most abundant, and most widely distributed (in their numerous subspecies) of all our birds. They are quite hardy, and many of them winter in the Northern states, but the majority go farther south, returning to their summer homes about the first of March. They may be found wherever there are bushes, vines, or hedges, and very often about houses, even in large cities.

Do not mistake the song sparrow for an English sparrow. Notice his distinguishing marks: the fine dark streaks on his light breast tend to form a larger blotch in the center. He is lighter than the swamp sparrow, larger than the chippy, has no white tail feathers like the vesper. You see him singing on the extended branch of some low tree, on the topmost twig of a bush, on a fence, or a piazza railing, from which he dives downward into the grass, or flies straight along into the bushes, his tail working like a pump handle as if to help his flight. Very rarely he flies upward. Diving into a bush is one of his specialties. He likes best to live in regions near water.

The Swamp Sparrow. Here is another true meadow bird or rather swamp bird; for, although you find him where you find his cousin, the song sparrow, he is more often among the low, briery bushes of the swamp. He has a simple, monotonous *tweet*, *tweet*, *tweet* for a song, but it is sweet and fills a real place among the alders and wild rose and button-bushes. In habits, nests, and eggs he resembles the song sparrows, except that he is rarely seen here in winter, being largely migratory.

Dickcissel. Here is a beautiful meadow bird that I have never seen alive; yet not so many years ago it was a not uncommon bird in the Atlantic states. Now it is rarely found east of the Alleghanies, although it is common in the Mississippi Valley.

Says Dr. Chapman: "It migrates in large flocks, the males in the spring being several days in advance of the females. About May 1 it reaches the latitude of Chicago, and by the middle of the month is mated. The nest is placed on the ground, or in low trees or bushes; eggs, four or five in number, are pale-blue."

Mr. Ridgway writes of this species: "While some other birds are equally numerous, there are few that announce their presence as persistently as this species. All day long, in spring and summer, the males, sometimes to the number of a dozen or more for each meadow of considerable extent, perch upon the summits of tall weed stalks or fence stakes, at short intervals crying out: *See, see — Dick, Dick Cissel, Cissel;* therefore 'Dick Cissel' is well known to every farmer's boy as well as to all who visit the country during the season of clover blossoms and wild roses, when Dame Nature is in her most joyous mood."

Maryland Yellowthroat. As you climb the fence into the meadow or work your way through low, thick growth in the bordering swale, a bold little yellow bird with black cheeks advances to meet you, crying impatiently, *chock*, *chit* — following you as you move along. It is the Maryland yellowthroat, and if you pause a moment you will hear him sing out his rapid *witch-e-wee-o, witch-e-wee-o, witch-e-wee-o.* Mr. Burroughs says he has heard birds whose notes sounded like the words "Which way, sir?" and I have heard some who seemed to say, "Wait a minute."

He also has "a flight song," Dr. Chapman says, "which is a miniature of the ovenbird's aërial serenade. It is generally added to his usual song, and is most often heard late in the season at evening, when the bird may be seen springing into the air above his bushy retreat.

"The yellowthroat arrives from the South about May 1, and remains until the middle of October. Late in May a bulky nest of grasses, strips of bark, and dead leaves, lined with finer materials, is built on or near the ground. The three to five eggs are white, rather thinly speckled with reddish-brown. Often an egg of the cowbird will be found in the nest."

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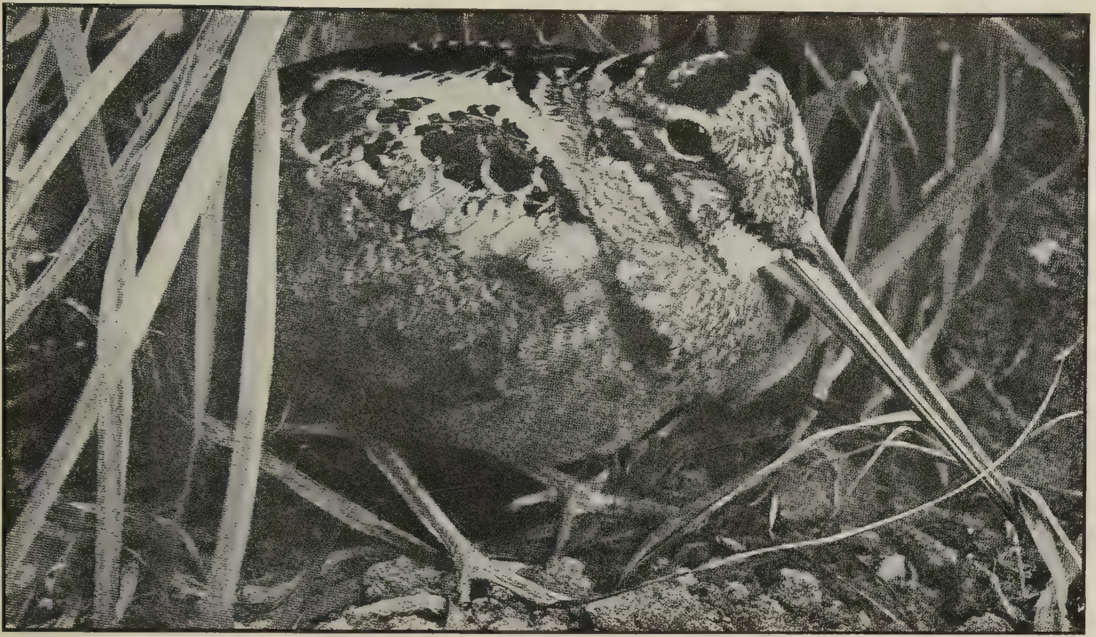
THE LAUGHING GULL, A BIRD OF THE SHORE



From American Ornithology

AMERICAN WOODCOCK, PHOTOGRAPHED FROM LIFE

BIRDS OF THE WET MARSH

THE LONG-BILLED WREN

I CAN hear him yet — thirty-five years away. Did you ever eat calamus buds, and drive the cows into the marsh meadows, and watch the tide come over the flats, and hear the gurgling, sputtering marsh wrens in the cat-tails and reeds? But you have done something just as good, no doubt. As I listen across all these years I hear the calking mauls in the shipyard, I hear the bubbling sound of water running into the fiddler crabs' holes, the roar of the tide through the meadow sluices, but more than all I hear the marsh wrens' smothered scolding and their joyous bursts of melody over the roof of their wide-reaching reedy house. A boy hears much of his whole life's music before he is eight! If I ever write any music, there will be long-billed marsh wrens in it.

The long-billed and short-billed marsh wrens look much alike; the former's bill is not so portentously long, only a little longer than that of his cousin, the short-billed marsh wren. While they were about it, why could not people have called them the "salt-water" and "fresh-water"? It would have distinguished them just as accurately and meant more to common, everyday folks.

"All up and down the coast, wherever the goose grass grows thick and tall, the wrens seem to swarm. They are the jolliest, noisiest, happiest little dots of things that inhabit the great green stretches of waste grounds, tide-flooded and flat, which border all the ocean-fed creeks and streams of the seaboard. Rapid and piquant beyond expression, their little twisty song shrills and reaches far across the creeks, inlets, and sounds. It has been likened to the winding of a dollar watch, but that was by a landsman. The sailor ear will at once note that it is more like a line reeving through a small creaking block. It has the very same up-and-down quality. Almost identical are the two sounds; I have heard them together many an early morning. And withal there is such jollity and frolic in it! One of the bird songs that thoroughly interprets the whole character and life of the singer.

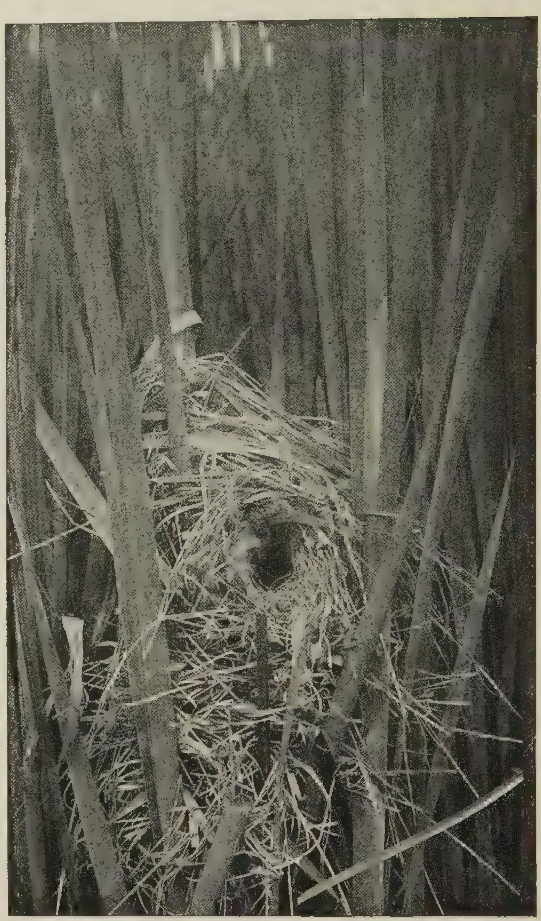
"Sociable and gossipy too are they, but I never have caught them quarreling. Always as busy as can be. In fact, I suspect they are too busy, for they build half a dozen houses before they get one that is just to their taste. Houses I say, too, for the nest is neatly roofed over and the front door has a porch over it so that it is hard for us big, clumsy humans to find an entrance. The building operations are well worth watching. Such a wee small bird as it is that goes fluttering past the looker-on, with a long spray of dead grass trailing away behind that looks much too big for so small a laborer.

"At the building site there is a rapid fire of argument and directions and a jumbling and tumbling about of the little architects, sometimes assisted by a neighbor. The rapid and nervous motions are too complicated to describe, but one thing you may be sure of. As soon as a wren alights, up goes its comical little tail over its back as if it were furnished with a spring that throws it up in the air as soon as the feet touch.

"Then the little eggs are things of rare beauty. Small, chocolate-colored all over, with just a suspicion of being darker at the big end. Sometimes it seems as if there were a dozen of them, but I can only confess to having found eight. When the mate is sitting, the father of the family can scold you well if you approach. His antics are most astonishing acrobatic feats as he balances on a blade of grass and rapidly 'swaps ends,' now peeping at you from this side and now from that, upside down as often as not, but always with that ridiculous little tail uptilted to its fullest extent. And he is smart enough, too, to go and perch on an empty nest so as to attract your attention away from the true habitation.

"Even these little folks seem to have a multitude of foes to contend with. There are mice that swim about in the marsh and plunder the nests, even in some cases preëmpting them for their own domicile. Then there are the blackbirds and grackles, not to mention the fish crows that account those little eggs a dainty morsel. High tides on rare occasions make the whole wide marshes one big sea for a few brief hours, and then the houses have to be built all over again.

"Drifting along down a narrow creek, it has been my good fortune once or twice to see a whole new little family of marsh wrens out on their housetop for an airing. The whole edifice was covered with the wiggling, squirming babies, and the old parents were in a perfect agony of excitement for fear I would harm their children. Never at those times was a camera handy."[1]



LONG-BILLED MARSH WREN'S NEST

The Sora or Carolina Rail and the American Bittern or Stake Driver. There are two interesting birds of the fresh-water marsh that I count as great finds whenever I get a glimpse of them. The sora or Carolina rail rarely nests farther south than New Jersey, but from August on can be found in the fresh meadows and among the river reeds and wild rice all along the coast — a blue-gray bird, barred beneath, that skulks along the deep runways, calling in the late afternoons *kur-we, kur-we,* in a high-pitched treble like the cry of the little screech owl. They fairly clatter among themselves, deep down in the ledges, like a company of spring frogs.

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[1] From "Our Dumb Animals."

The other exciting fellow is the bittern or stake driver or "pumper," whichever you choose to call him. "Boomer" he might well be called, from the hollow bunghole sort of sound he makes as he stands in the meadow doing his pump-handle song — *plunk-er-lunk, plunk-er-lunk*.

"A booming bittern I know," says Mrs. Blanchan, "sits hour after hour, almost every day in summer, year after year, on a dark, decaying pile of an old dock in the creek. Our canoe glides over the water so silently it rarely disturbs him. The timid bird relies on his protective coloring to conceal him in so exposed a place and profits by his fearlessness in broad daylight next to an excellent feeding ground. At low tide he walks about sedately on the muddy flats, treading out a dinner. Kingfishers rattle up and down the creek, cackling rails hide in the sedges behind it, red-winged blackbirds flute above the phalanxes of rushes on its banks; but the bittern makes more noise, especially toward evening, than all the other inhabitants of the swampy meadows except the frogs, whose voices he forever silences when he can. Frogs, legs and all, are his favorite delicacy."

The Virginia Rail.[1] "This rail is found much more often than his near relative, the sora, as he is not so local in his habitat nor so careful in his choice of a nesting site. Almost any thoroughly wet meadow will do. These birds may be distinguished by their larger size, by the long curved bill and by the general rich, ruddy appearance of the under parts. Unless migrating or disturbed near their nest they are hard to flush or to see, but are very frequently heard. The most common notes are a loud grunt and a *cut-ta, cut-ta, cut-ta* or *kid-ic, kid-ic* song which contrasts with the *kur-we* of the Carolina. An excellent description is to be found in an article entitled 'Voices of a New England Marsh,' by William Brewster."[2]

The Gallinules.[3] "Fully as noisy in the spring as the 'stake driver' is the Florida gallinule, but as he is less generally distributed and much more rarely seen, there are few who know him well. In the wet fresh swamps during May and June one may hear a loud explosive *keck, keck,* followed now and then by a series of clucks and loud scolding cries which Mr. William Brewster describes as 'very like those of a hen in the clutches of a hawk, only slower and at longer intervals; sometimes closely resembling those of a brooding hen when disturbed, but louder and sharper.'[4] By watching the patches of open water one may see a bird looking like a duck, but with a very erect head and neck, which it nods forward and back as it swims, hurrying from one cover to another. In flight, the legs hang down like a rail though the feet are lobed, not webbed; but on the ground they are very active, weaving rapidly in and out among the bushes, becoming difficult to see when frightened. The purple gallinule, which is more southerly in distribution, is a more graceful and beautiful bird, having green back, wings,

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BITTERN ON NEST

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[1] By Warren F. Eaton.

[2] Bird-Lore, Vol. 4, pp. 43–56, 1902.

[3] By Warren F. Eaton.

[4] The Auk, Vol. 8, pp. 1–7, 1891: "A Study of Florida Gallinule."

and tail instead of the brown of its cousin, and a purple iridescent caste to the under parts instead of slaty blue. Both have bright red bills and a hard shield or plate at the base which extends up on the head, and a white area on the under-tail coverts. When disturbed, the purple gallinule will erect its tail so that the white shows clearly and evidence its disapproval by jerking motions, which give it a curious appearance."

The Pied-billed Grebe.[1] "In any secluded swamp of the sort where the rails and gallinules are found, you may locate another peculiar marsh dweller, the 'dab-chick,' 'hell-diver,' or grebe — provided there be a bit more open water. As the name implies, these birds are very expert divers, being able to sink in the water by a contraction of the feathers or to dive like a flash when alarmed. In appearance a small duck, but brownish black with a black throat, the grebe is smaller than a gallinule, always sits lower in the water, and has a black band across its bill

"They are not bright-colored, and have a trick of swimming with only their neck or bill out of water after a dive. Their call or song in the spring is not unlike a combination of those of the gallinule and the least bittern, beginning with a loud *kuk-kuk-kuk* and fading off into a *kow-oo, kow-oo, kow-oo.*"

The Avocet. One of the rarer of our North American marsh birds that I had the pleasure of watching last summer on the fresh marshes of the Far West was the avocet. I caught its young in my hands and had the old birds crying and teetering on their spindle legs close to me in their anxiety.

The avocet is a large, snipelike bird, with a long bill that turns *up* instead of down, as if the bird when young had accidentally fallen and dislocated its nose. Nature provided the bird with that sort of bill for an especial purpose, just as she provides all her children with the means most useful to them in their several modes of life.

This most interesting bird is unfortunately every year becoming more rare. Years ago, avocets were numerous throughout the Middle West; to-day they are confined to a comparatively small region in the Far West, and even there they are scarce.

The prevailing color of most wading birds is a natural brown, inconspicuous, as becomes their mode of life among the rushes and on the sand dunes. But the avocet is a very beautiful bird; his plumage is a harmonious blending of cinnamon, black, and white, and he has dull-blue legs and feet. The pure white and jet-black of his plumage make him strikingly conspicuous against a background of brown rushes. That may help to account for his almost total extinction.

Avocets can wade, swim, or fly, and show no especial preference for any particular mode of travel. If a party of avocets are feeding in the shallow water, and you approach nearer than a short acquaintance warrants, they walk out into the water in a dignified fashion until they get beyond their depth and then swim away duck fashion, as if their feet were provided with adequate webs, which they are not. If you are rowing a flat-bottomed skiff, and surprise them swimming, they take wing quickly. At first they dangle their long legs awkwardly, like a heron, but soon stretch them out behind to act as a rudder.

At first glance the curious upturned bill seems to be poorly fitted to delve among the ooze and slime for minute insect life. So it would be if the avocet tried to probe the mud like other wading birds. But his bill makes an admirable shovel. The avocet wades out up to his knees, thrusts his head and neck forward, and plowing along the bottom gathers his dinner with the greatest ease. Not a water bug in the path of that bill escapes.

The great Buffon, theorizing on the bill, called it "one of those errors or essays of Nature, which if carried a little further would destroy itself, for if the curvature of the bill were a degree increased the bird could not procure any sort of food at all." Who is the wiser, Nature or Buffon?

If the avocet is strikingly dressed, and seems to set at naught the law of "protective coloration," his nest is a splendid example of that law. The female bird draws together a few dried tule stalks in a hidden nook among the rushes, and lays four dark-brown eggs with lavender markings. They are almost invisible unless you know exactly where to look for them.

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[1] By Warren F. Eaton.

Copyright, Boston Photo News Co.

"HERE MEET LAND AND RIVER, SKY AND SEA; HERE THEY MINGLE AND MAKE THE MARSH"

BIRDS OF THE SALT MARSH

LEAVING the sight of the town, we pass on down the river marsh to the point where the brackish water comes in, followed all the way by the little wrens. But now we are in a different bird world — wilder, freer, wider, that runs miles and miles off to the broad bay and the seashore. Here are the nests of the fish hawks, clappers, rails, marsh hawks, marsh owls, seaside finches, sharp-tailed sparrows, and shore birds. One who comes from the Middle states or even out of a hilly, wooded country into the salt marshes, enters a new world entirely.

THE SEASIDE SPARROWS

Sharp-tailed Sparrow. Notice that the sides of the head, breast, and flanks are buff with black streaks; tail feathers sharp.

Found in salt marshes along the seacoast or along streams emptying into the ocean, they creep about like mice in the salt grass, now running across an open space, now threading their way through the upright stalks. They build nests of seaweed and marsh grass, attached to the grass stalks several inches above ground and often covered by a mass of dry seaweed. Eggs are greenish-white specked with brown.

Seaside Sparrow. Notice the yellow spot before the eye and observe that the plumage is grayish-green with no black markings. The habits of these sparrows are like those of the sharp-tailed sparrows. The nests and eggs are indistinguishable and are often found in the same marshes.

Let me describe, from "Roof and Meadow,"[1] a tramp I made through the vast salt marshes along the Delaware Bay on the Jersey side.

"Everywhere as I went along, from every stake, every stout weed and topping bunch of grass, trilled the sharp-tailed sparrows — a weak, husky, monotonous song of five or six notes, a little like the chippy's, more tuneful, perhaps, but not so strong. They are dark, dusky birds, of a grayish olive-green hue, with a conspicuous buffy line over the eye. Here, too, were the seaside sparrows with the yellow spot before the eye.

"There seems to be a sparrow of some kind for every variety of land between the poles. Mountain tops, seaside marshes, inland prairies, swamps, woods, pastures — everywhere, from

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[1] By permission of The Century Company.

Indian River to the Yukon, a sparrow nests. Yet one can hardly associate sparrows with marshes, for they seem out of place in houseless, treeless, half-submerged stretches. These are the haunts of the shier, more secretive birds. Here the ducks, rails, and herons — birds that can wade and swim, eat frogs and crabs — seem naturally at home. The sparrows are perchers, grain eaters, free fliers, and singers; and they, of all birds, are the friends and neighbors of man. This is no place for them. The effect of this marsh life upon the flight and song of these two species was very marked. Both showed unmistakable vocal powers which long ago would have been developed under the stimulus of human listeners; and during all my stay (so long have they crept and skulked about through the low marsh paths) I did not see one rise a hundred feet into the air, nor fly straight away for a hundred yards. They would get up just above the grass, and flutter and drop — a puttering, short-winded, apoplectic struggle, very unbecoming and unworthy.

"**The Spotted Sandpiper.** By noon I had completed a circle and recrossed the lighthouse road in the direction of the bay. A thin sheet of lukewarm water lay over all this section. The high spring tides had been reënforced by unusually heavy rains during April and May, giving a great area of pasture and hay land back, for that season, to the sea. Descending a copsy dune from the road, I surprised a brood of young killdeers feeding along the drift at the edge of the wet meadow. They ran away screaming, leaving behind a pair of spotted sandpipers, 'till-tops,' that had been wading with them in the shallow water. The sandpipers teetered on for a few steps, then rose at my approach, scaled nervously out over the drowned grass, and, circling, alighted near where they had taken wing, continuing instantly with their hunt, and calling *tweet-tweet*, *tweet-tweet*, and teetering, always teetering, as they tiptoed along.

"How is the body of till-top balanced on its needle legs? If till-tops have not been tilting forever, and shall not go on tilting forever, it is because something is wrong with the mechanism of the world outside their little spotted bodies. Surely the easiest, least-willed motion in all the universe is this sandpiper's *teeter*, *teeter*, *teeter*, as it hurries peering and prying along the shore.

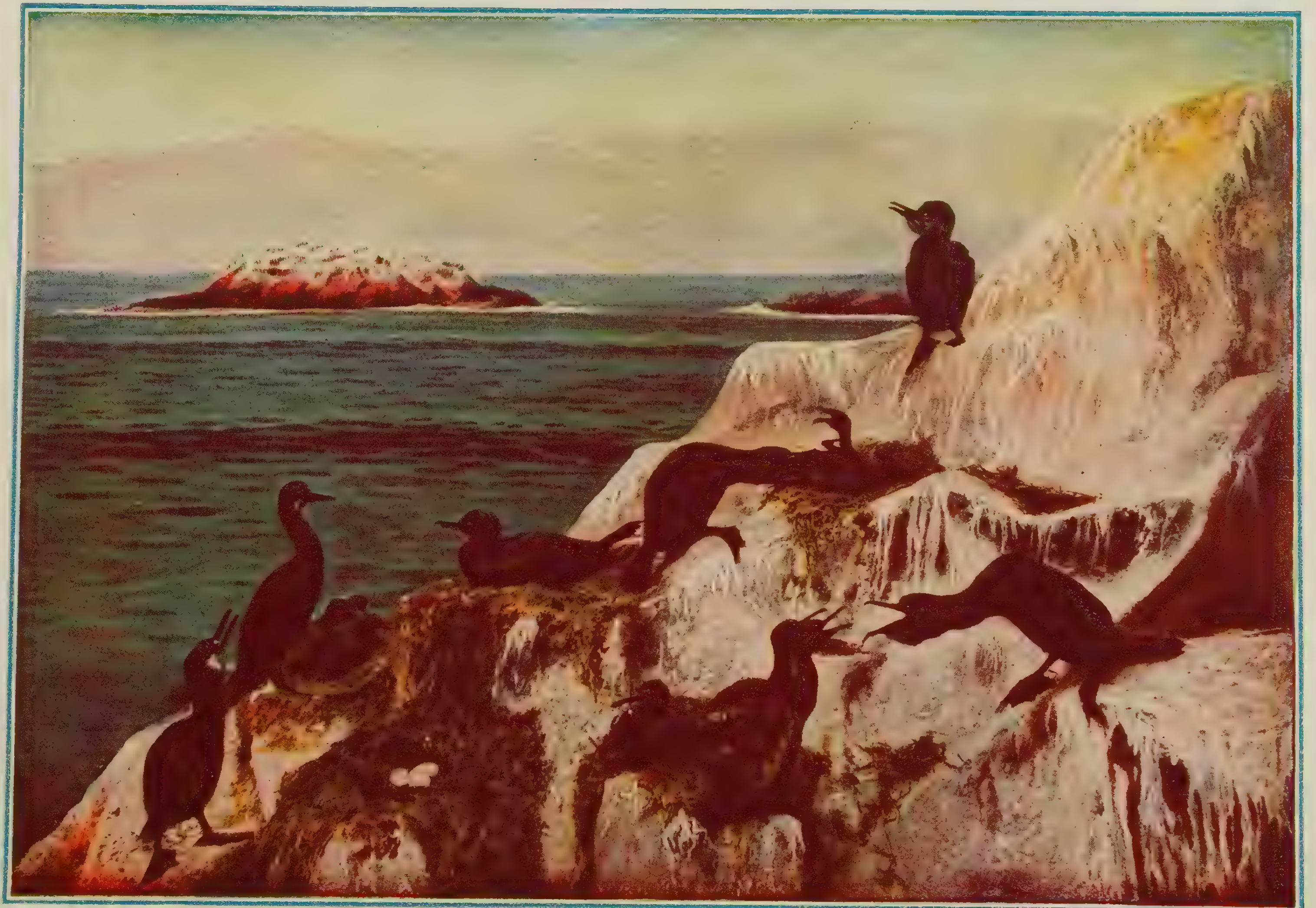
"The killdeers are noisy birds; and anyone would know, after half a day upon the marsh, even if he had never seen these birds before, that they could never have been bred here. For, however

"'candid and simple and nothing-withholding and free'

the marsh may seem to one coming suddenly from the wooded uplands, it will not let one enter far without the consciousness that silence and secrecy lie deeper here than in the depths of the forest glooms. The true birds of the marsh, those that feed and nest in the grass, have the spirit of the great marsh mother. The sandpiper is not her bird. It belongs to the shore, living almost exclusively along sandy, pebbly margins, the margins of any, of almost every water, from Delaware Bay to the tiny bubbling spring in some Minnesota pasture. Neither is the killdeer her bird. The upland claims it, plover though it be. A barren, stony hillside, or even a last year's cornfield left fallow, is a better-loved breast to the killdeer than the soft brooding breast of the marsh. There are no grass birds so noisy as these two. Both of them lay their eggs in pebble nests; and both depend largely for protection upon the harmony of their colors with the general tone of their surroundings.

"**The Marsh Hen or Clapper Rail.** I was still within sound of the bleating killdeers when a rather large, greenish-gray bird flapped heavily but noiselessly from a muddy spot in the grass to the top of a stake and faced me. Here was a child of the marsh. Its bolt-upright attitude spoke the watcher in the grass; then, as it stretched its neck toward me, bringing its body parallel to the ground, how the shape of the skulker showed! This bird was not built to fly or to perch, but to tread the low, narrow paths of the marsh jungle, silent, swift, and elusive as a shadow.

"It was the clapper rail, the 'marsh hen.' One never finds such a combination of long legs, long toes, long neck and bill, with this long but heavy, henlike body, outside the meadows and marshes. The grass ought to have been alive with the birds: it was breeding time.



A ROOKERY OF BRANDT'S CORMORANTS, NEAR MONTEREY, CALIFORNIA

These birds nest on the almost inaccessible tops of ocean rocks.
Habitat group in American Museum of Natural History, New York.

But I think the high tides must have delayed them or driven them elsewhere, for I did not find an egg, or hear at nightfall their colony cry, so common at dusk and dawn in the marshes. At sunset in nesting time a rail will begin to call — a loud, clapping roll; a neighbor takes it up, then another and another, the circle of cries widening and swelling until the whole marsh is a-clatter.

The Mud Hen or Coot. "As I stood measuring the width of a little creek, down its slow waters came swimming a short, dark, bluish bird about the size of a gallinule, with a conspicuously whitish bill. I knew him from the bill and the way he bobbed his head, for the coot, which nests in the fresh-water swamps, but is at home in salt, fresh, or brackish water.

The Fish Hawk. "I was well out into the marsh when I saw a fish hawk flying toward me, her white breast glistening and in her talons a big, writhing fish. It was a magnificent catch. 'Bravo!' I should have shouted — rather I should n't; but here she was right over me, and the instinct of the boy, of the savage, had me before I knew, and, leaping out, I whirled my cap and yelled to wake the marsh. The startled hawk jerked, keeled, lifted with a violent struggle, and let go her hold. Down fell the writhing, twisting fish at my feet. It was a splendid striped bass, weighing at least four pounds, and still live enough to flop.

"I felt mean as I picked up the useless thing and looked far away to the great nest with its hungry young. I was no better than the bald eagle, who had stolen the dinner of these same young hawks the day before.

"Their mother had been fishing up the river and had caught an eel. An eel can hold out to wriggle a very long time. He has no vitals. Even with talon-tipped claws he is slippery and more than a clawful; so the old hawk took a short cut home across the railroad track and the corner of the woods where stands the eagle tree.

"She could barely clear the tree tops, and, with the squirming of the eel about her legs, had apparently forgotten that the eagle lived along this road, or else in her struggle to get the prize home she was risking the old dragon's being away. He was not away. I have no doubt that he had been watching her all the time from some high perch, and just as she reached the open of the railroad track, where the booty would not fall among the trees, he appeared. His first call, mocking, threatening, commanding, shot the poor hawk through with terror. She screamed; she tried to rise and escape; but without a second's parley the great king drove down upon her. She dropped the fish, dived, and dodged the blow, and the robber, with a rushing swoop that was glorious in its sweep, in its speed and ease, caught the eel within a wing's reach of me and the track.

"A fish hawk will make its nest upon the ground, or a hummock, a stump, a buoy, a chimney — upon anything near the water that

CLAPPER RAIL ON NEST

See how it hides in the grass!

offers an adequate platform; but its choice is the dead top of some lofty tree where the pathway for its wide wings is open and the vision range is free for miles around.

"How dare the bird rear such a pile upon so slight and towering a support! How dare she defy the winds, which, loosened far out on the bay, come driving across the cowering, unresisting marsh! She is too bold sometimes. I have known more than one nest to fall in a wild May gale. Many a nest, built higher and wider year after year, while all the time its dead support has been rotting and weakening, gets heavy with the wet of winter, and some night, under the weight of an ice storm, comes crashing to the earth. I climbed the old tree and crawled over into the nest.

"Upright in a hawk's nest! Sixty feet in the air, on the top of a gaunt old white oak, high above the highest leaf, with the screaming hawks about my head, with marsh and river and bay lying far around! It was a moment of exultation; and the thrill of it has been transmitted through the years. My body has been drawn to higher places since; but my soul has never quite touched that altitude again, for I was a boy."

In summer, says Mrs. Blanchan, "the fish hawks frequent the inlets along the Atlantic coast, but over inland lakes and rivers also many fly back and forth. You may know them by their large size — they are almost two feet long — and by their slow flight and white under parts. Their dusky backs and white under parts harmonize well with the marine picture, North or South. Their plumage contains more white than that of any other hawk. No matter how foggy the day or how quietly the diving osprey may splash to catch his fish dinner, any bald-headed eagle in the vicinity is sure to detect him in the act of seizing it, and then to relieve him of it instantly."

The Bald or White-headed Eagle. Only the eagles' nests upon the fierce, dizzy pinnacles in the Yosemite surpass the home of the fish hawk in unawed boldness. The aerie of the Yosemite eagle is the most sublimely defiant of things built by bird or beast or man. Many of these "eagles'" nests, Mr. Pearson, of the National Audubon Societies, tells me, are fish hawks' nests. I have never seen a golden eagle's nest, but not far from the marsh I am now describing, in sight, indeed, from where I lived for a time as a boy, stood an old eagle tree in whose top was the huge nest of the bald eagle — our national bird, and the notorious robber of the fish hawk.

Two young ones taken from their nest and brought up by hand grew so savage that it was dangerous to go into their cage. We sent them to the zoölogical gardens at Philadelphia, where they may be now, as eagles live to an old age.

The golden eagle builds on the ledges in the mountains of the West and has been carefully studied by my friend Finley in the mountains of California. It is a rare bird in the East, and many a so-called golden eagle turns out to be an immature bald-headed bird that has not grown old enough to turn white. I was happy to come upon one along the road just outside of Boston in 1912 that allowed me to approach to within fifty feet of it in my automobile.

It was because of the eagle's lazy robber ways with the fish hawk that Benjamin Franklin said he did not think that the eagle should be taken as the emblem of the United States. Such a dishonest bird! But he is not worse than many other eagles. They all do it. The falconers in India well know that the tawny eagle is one of the worst enemies of the trained hawks and is always likely to chase these birds, so that they are often driven away and lost. Even if the hawk is not carrying any game, it is wearing the "jesses" or leg straps, and the eagle, seeing these trailing behind and thinking that the hawk has got something which it can steal, takes after it.

The Marsh Owl. Another wild resident of the marsh is the short-eared or marsh owl. I remember one night when I crossed the wide marshes at East Point Light on the Delaware and waited on the beach to watch the moon come up.

High tide at nine o'clock and a full moon over the marsh with it! What a sight moon and marsh and rising tide would make!

"In the yellow light I could make out the line of sentinel trees across the marsh, and off on the bay a ship, looming dim in the distance, coming on with wind and tide. There were no sounds except the long, regular wash of the waves, the stir of the breeze in the chafing sedges, and the creeping stepping of the water weaving everywhere through the hidden paths of the grass. Presently a nighthawk began to flit about me, then another and another, skimming just above the marsh as silent as the shadows. What was that? Something moved across the moon. In a moment, batlike and huge against the great yellow disk, appeared a marsh owl. He was coming to look at me. What was I that dared remain abroad in the marsh after the rising of the moon, that dared invade this eerie realm, this night-spread, tide-crept, half-sea land where he was king? How like a goblin he seemed? I thought of Grendel, and listened for the splash of the fen monster's steps along the edge of the bay. But only the owl came. Down, down, down he bobbed, till I could almost feel the fanning of his wings. How silent! His long legs hung limp, his body dangled between those soft, wide wings within reach of my face. Yet I heard no sound. Mysterious creature! I was glad when he ceased his ghostly dance about me and made off."[1]

The Marsh Hawk. This is the harrier of the marsh; the owl by night and this beating, quartering, fierce-eyed hawk by day sending every small inhabitant of the sedges into his cellar for safety. The marsh hawk never soars or sails, but on sure, firm wings beats his dangling way above the salt grass and ditches. It is a great mouser and one of our good friends.

The nest is placed on the ground, and is only a collection of twigs and hay, from three to six inches in height and a foot or more in diameter. The eggs are sometimes laid on a bed of green moss, with the material arranged in a circular form. The bird may be seen during the spring and summer months sweeping slowly over meadows and bottom lands in pursuit of mice, birds, and large insects. It can readily be recognized by the pure white upper tail coverts, the male above bluish-ash, whitening below; the female above dark umber-brown.

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[1] From "Roof and Meadow." By permission of The Century Company.

Photographed by Silas A. Lottridge
Copyright, 1905, by Henry Holt & Co.

RED-TAILED HAWK *(Buteo borealis)*

BIRDS ON THE SWAMP CREEK

"AT the bridge where the road crossed was a dam which backed the creek out into an acre or more of pond. Not a particle of mud discolored the water; but it was dark, and as it came tumbling, foaming over the moss-edged gates it lighted up in a rich amber color, the color of strong tea. In the half chill of the dawn the old bridge lay veiled in smoking spray, in a thin, rising vapor of spicy odors, clean, medicinal odors, as of the brewing of many roots, the fragrance of shores of sedges, ferns, and aromatic herbs steeped in the slow, soft tide. And faint across the creek, the road, and the fields lay the pondy smell of spatter-docks."[1]

I am sure you know of such a creek — a branch of some large river or it may be the head waters of the river itself away up in the tangled timbered swamp. The bird life on such a creek is as distinct in my part of the country as you would find it in visiting a foreign land.

As you push out from the sandy cove a reach of the lusty docks lies between you and either shore. It is early morning. The yellow, dew-laid road down which you came still slumbers undisturbed; the village cows have not been milked, and the pasture slope, rounding with a feminine grace of curve and form, still sleeps, with its sedgy fingers trailing in the water. But the creek people are stirring — except the frogs, for now, seeing nothing worth while in the dawn of this wonder day, they begin to doze. But the birds are alive, full of the June morning gladness, and telling their joy in chorus up and down both banks of the creek.

But these — the redwings, orioles, sparrows, robins, catbirds, and thrushes — we are already familiar with. It is a different set entirely that we shall see as soon as we have made headway up the windings of the narrow, overshadowed creek.

The Belted Kingfisher. But we have hardly started from the shore of the little pond when a new and alarming rattle wakes the creek, as a belted kingfisher cuts a blue streak through the mist that hangs a white sheet over the water. Yonder in the sandbank is his nest hole, at the bottom of which, could we dig them out, we should find four to six white eggs.

A certain part of a favorite lake or stream the kingfisher patrols with a sense of ownership and rarely leaves it. Alone he clatters up and down his beat as a policeman, going his rounds, might sound his rattle. The bird knows every pool where minnows dart, every projection along the bank where a pickerel might hide. You will know this big, chunky bird, fully a foot long, with grayish-blue upper parts, the long, strong wings and short, square tail dotted in broken bars of white, and with a heavy, bluish band across his white breast. The crested feathers on top of his big, powerful head reach backward to the nape and give him distinction. Under his oily plumage, which is perfectly waterproof, he wears a suit of down underclothing.

The Least Bittern. We have not yet entered the swamp or the narrow creek and have not yet passed from the chorus of the red-winged blackbirds. Chiming in everywhere sing the catbirds, white-eyed vireos, yellow warblers, orchard orioles, and Maryland yellow-throats; and at short intervals, soaring for a moment high over the other voices, sound the thrilling, throbbing notes of the cardinal, broken suddenly and drowned by the roll of the flicker, the wild, weird cry of the great-crested flycatcher, or again the rapid, hayrake rattle of the belted kingfisher.

But here the pond narrows through the spatter-docks and elder and turns in between the ivory buttonbushes and arrowwood, whose tiny flower crowns are floating in patches down-stream, its over-sweet breath hanging heavy in the morning mist. We sniff the air all the way for magnolias and water lilies, yet never a whiff from either shore, so particular, so unaccountably notional are some of the high-caste flowers with regard to their homes.

The skiff edges slowly past the first of the islands, a mere hummock about a yard square, and is turning a sharp bend farther up, when we catch a glimpse of yellowish wings, a mere guess of a bird shadow, dropping among the dense maple saplings and elder of the islet.

Had we seen or simply imagined something?

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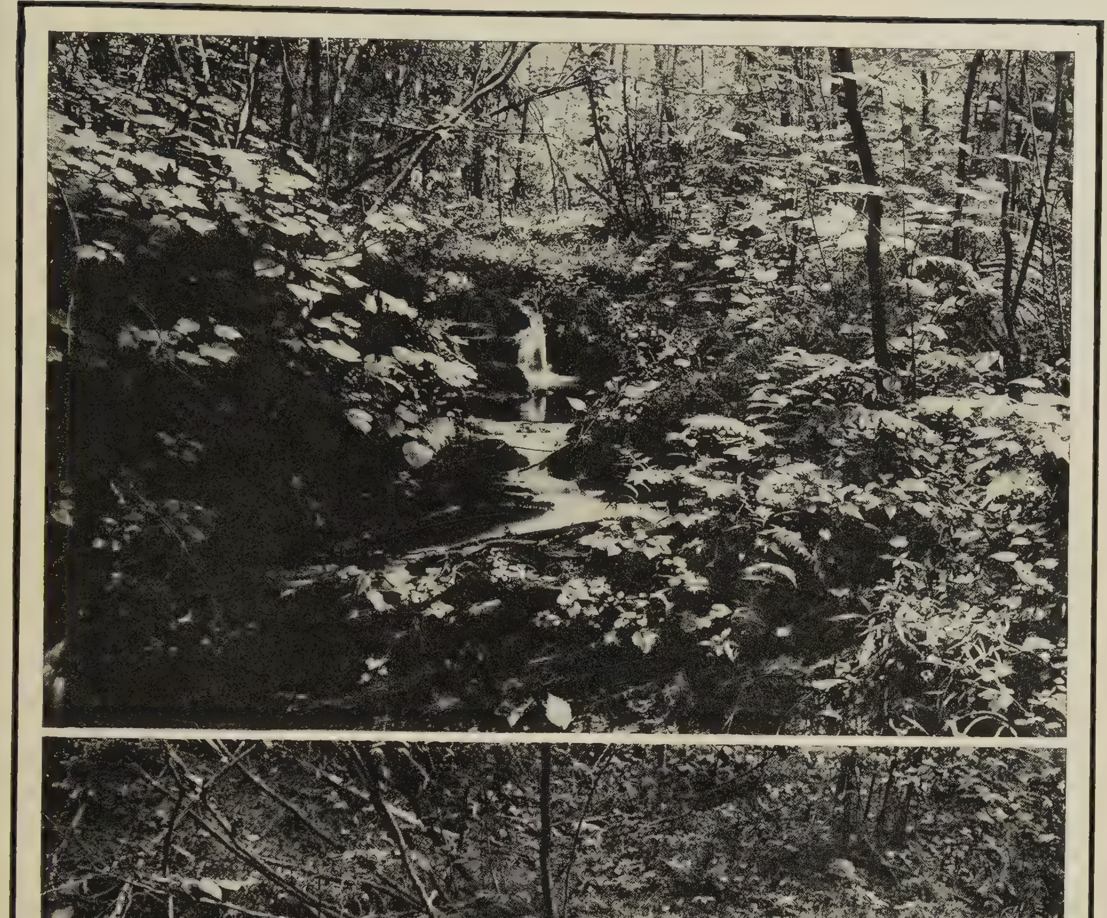
[1] From "Wild Life near Home." By permission of The Century Company.



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THE SWAMP THICKET

Above: The waterfall and pool, with grape and bracken. Below: Brook, with sword fern and alder stems.

If wings, then they were not those of the thrasher — the first bird that came to mind — for they slipped, sank, and dropped through the bushes, with just a hint of dodging in their movement, not exactly as a thrasher would have moved.

Drifting noiselessly back, we search the tangle and must have been looking directly at the bird several seconds before cutting it out from the stalks and branches. It is a least bittern, a female. She is clinging to a perpendicular stem of elder, hand over hand, wren fashion, her long neck thrust straight into the air, absolutely stiff and statuesque.

We are less than a skiff's length apart, each trying to outpose and outstare the other. I win. Human eyes are none the strongest, neither is human patience, yet I have rarely seen a creature that could outwait a man. But she knows she is discovered, that her little trick of turning into a stub is seen through; and immediately, ruffling her feathers, she lowers her head, pokes out her neck at us, and swaying from side to side like a caged bear tries to scare us, glaring and softly growling.

And here is her nest (a rare find too) in the rosebushes overhanging the water — a flimsy platform of coarse sticks, the size of a boy's cap, covered with five dirty white eggs. The little hen had to stand and straddle the nest to keep from knocking the eggs into the water.

The Green Heron. Now we are in the real swamp of shaggy trees and looping vines and rank undergrowth on each side reaching far away into the half twilight. Here winds the narrow creek past muskrat holes and dives.

Stop and put your nose down for a sniff, so good is the smell of a fresh trail. In the thick of the swamp we stop again to examine the footprints of an otter at a shallow, shelving place along the bank, where, opening through the skunk cabbage and Indian turnip, and covered almost ankle-deep with water, is the creature's runway. As we rise from the slide a little greenish bird with red-brown neck, about the size of a leghorn hen, goes dangling up the creek calling *squawk*, *squawk*, as if the very life were frightened out of it. It is the little green heron or "poke," an exquisitely colored bird in tints of glossy green, black, buff, rufous, and bluish, as beautiful a heron as the wood duck is of his kind. This is a solitary bird with a nest in just this wild, wet, wooded kind of spot. The nest is built of loose sticks in a bush not far from the ground.

The Great Blue Heron. Narrower grows the creek as we near the head waters, and in front we see the open sky on one side where a low, level meadow or swale like a bay of sedge makes into the swamp.

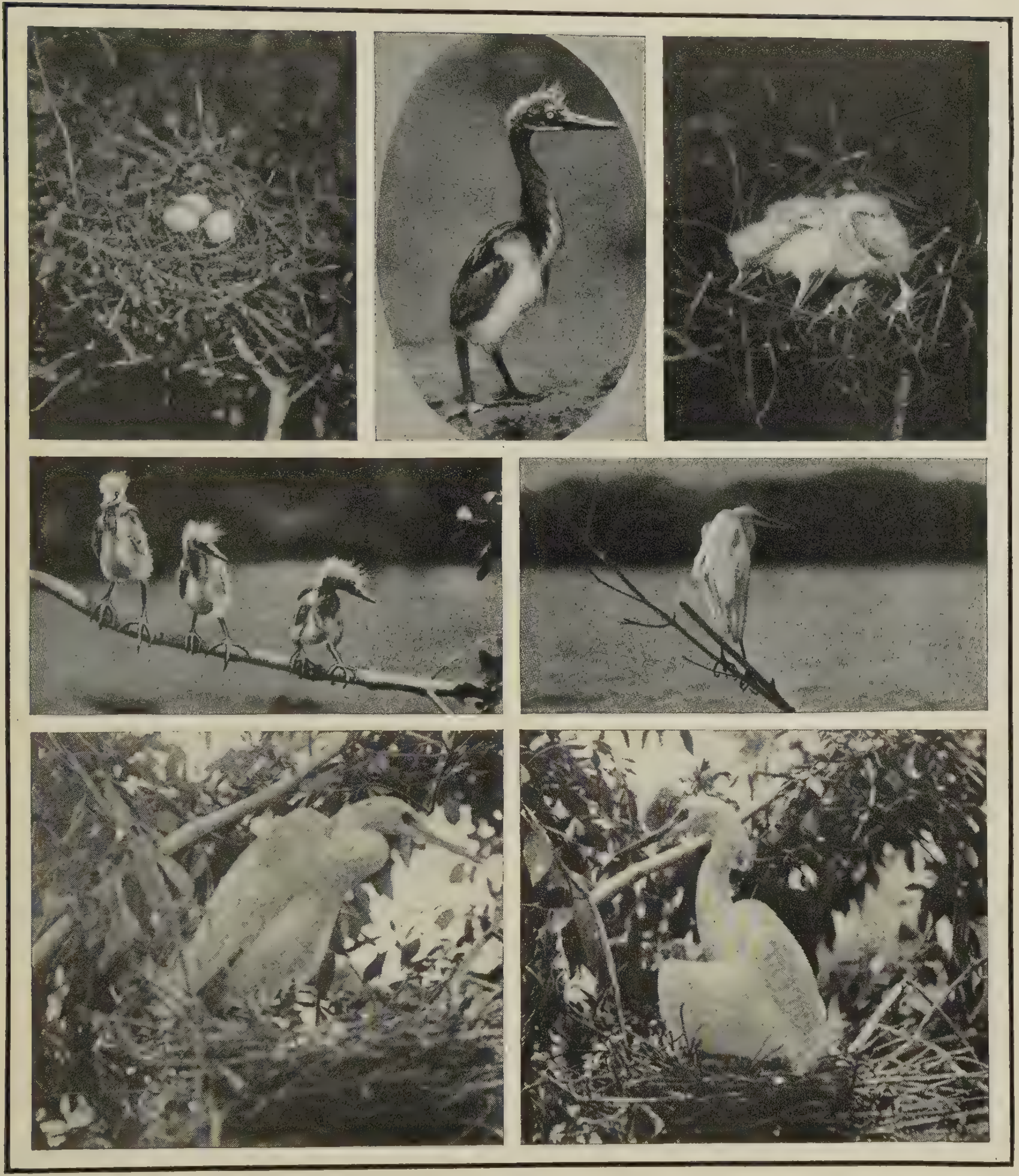
All the way up the creek we have been hearing the throaty *ghouw-bhouw* of a great blue heron off in the swamp. Slowly now, for he is sure to be fishing just in the edge of the swale. There he goes!

The flapping of the great blue heron is a sight good for the soul — an unheard-of motion these days, so moderate, unhurried, and time-contemning! The wing-beats of this one, as he goes dangling down upon the meadow opposite, is one of the sights of the trip. If we could have the wings of the great blue heron and flap to our fishing now and again!

You cannot go far into the marsh or river swamp before this great, lumbering, long-winged, long-legged, long-necked, long-beaked creature will flap up so close to you as to scare you out of your wits, and go clomping off in the air — as if an old Dutch windmill had suddenly started to fly! It is the great blue heron. His nest is back in the wooded swamp somewhere in a tall tree. He is hunting here in the meadow; here is where he really belongs and here you will most often see him.

His body is slaty-gray; top of head and throat white; long bill yellow beneath; legs black; bend of wing reddish-brown; blackish crest; feathers on breast long and streaky; stands on one leg; flies slowly with neck drawn in and legs extended behind; has a hoarse call.

The great blue heron is a solitary fellow; you never see two together, and yet he is almost always within eyeshot or earshot of his fellows. If you disturb a heron from the ditch in a water meadow where he has speared a water vole, an eel, or a troutling, he rises generally with a loud cry of alarm, which will be heard by his fellow who is fishing or dozing, in a similar ditch, a quarter of a mile away. You will hear an answering cry; and, within a few moments, you will see not one, but a pair or more of herons, flapping slowly and



PLUME BIRDS

Top row: (1) Eggs of egret in nest, (2) Young Louisiana heron, (3) Young white herons clamoring for food. Second row: (1) Louisiana herons, (2) White heron perched. Bottom row: Two views of an egret on its nest.

majestically through mid-air. But no one has ever seen this particular heron with or near a mate. No other heron is to be found, even as a casual visitor, within three or four miles of him. He has, apparently, no kith, no kin — not until you come upon his nest in some tall swamp tree; for sometimes you will find him and others of his kind building in a colony each his own big nest of sticks, in each of which are laid three or four pale-blue eggs.

If you ever see him flapping like an old Dutch windmill over you, river or meadow, watch until you find his feeding spot; for here he will come day after day, year after year, unless you frighten him, standing stock still on his long legs, waiting in the edge of the water for the luckless frog or fish, when flash! and the quarry is wiggling on the end of the spear-like bill. Then once more the big blue bird is as still as a stub — but his eye is on the water and no pout or sucker is quick enough to escape the plunge of that bill.

The Black-crowned Night Heron. Carefully, noiselessly we push and nose our way along, for it is still early morning and there is another fisher here on the creek we wish to see. Look on the water line in the reeds and cat-tails bordering the meadow. There he sits watching us — the black-crowned night heron, not yet gone home to his nest — to his colony I should say, for wherever they have been unmolested these birds build together in trees by the hundreds.

You will more often see them and hear them going over the yard in the dusk, uttering that far-off mysterious *quark, quark*, which has led to their common name of "quawk." In the marshes of the Middle West you will find them building, out on the flat bottoms, nests made of cat-tails, flags, and dried grasses.

The White Heron or Egret.[1] "The story of this bird is a most remarkable one, in that the whole history of bird protection in the United States is connected with it. Not many years ago the wearing of plumes or aigrettes on ladies' hats was fashionable. The number used by the millinery trade was enormous. Dr. Frank Chapman says: "No form of feather adornment has been more harmful in its effects than the wearing of aigrettes. These dainty, graceful feathers, unlike the distorted skin of some poor humming-bird or warbler, carry with them no suggestion of death, and many a woman on whose hat they are placed is wholly ignorant of the unspeakable cruelty the taking of these feathers entails." The plumes are the wedding dress of the white herons and are worn only during the nesting season. For many years prior to the passage of the Plumage law, thousands of birds were shot, stripped of their plumes and left in the swamps of the South to rot, while the young died of neglect in their nests. The National Association of Audubon Societies was organized to fight the use of birds and their feathers in the millinery trade, and has now after a long fight succeeded in its task. A few years ago the snowy heron and the white heron or egret, the species which were most hunted for their plumes, were practically exterminated in Florida and in the Southwest and West. To give an idea of the numbers killed, one Florida hunter boasted that he and his party had slaughtered 130,000 birds in one season, including more than three hundred egrets alone, in one afternoon.

"Now it is all changed. State and Federal laws protect the birds. Plume hunting has practically ceased. Thanks to the rigid protection they have received on Audubon and other sanctuaries, the herons have increased greatly. Each year after the nesting season, thousands of white herons and others wander north, east and west from their colonies in the South."

Little Blue Heron.[2] "But not all white herons are egrets nor are the smaller snowy herons. Strange to say, most of those seen in the east are actually little blue herons, for the young birds are practically pure-white with occasional blue or slate tips to their wings. The little blue heron was not so frequently killed, as its feathers did not grow the long plumes which were so attractive to the hunters; but all the heron rookeries suffered together. The egret may be distinguished by his large size (nearly that of the great blue heron) and by his black legs and bright yellow bill. The snowy heron is much smaller, but has a thin black bill, black legs, and bright yellow feet. It is more likely to be confused with the 'white' little blues, which are always more common, but which have greenish-yellow bills, legs, and feet. About one in every hundred of the herons which come north in August will prove to be an adult little blue heron with its head and neck maroon chestnut, and its body a dark, slaty blue. The snowy, little blue, and black-crowned night herons are all about the same size, a bit larger

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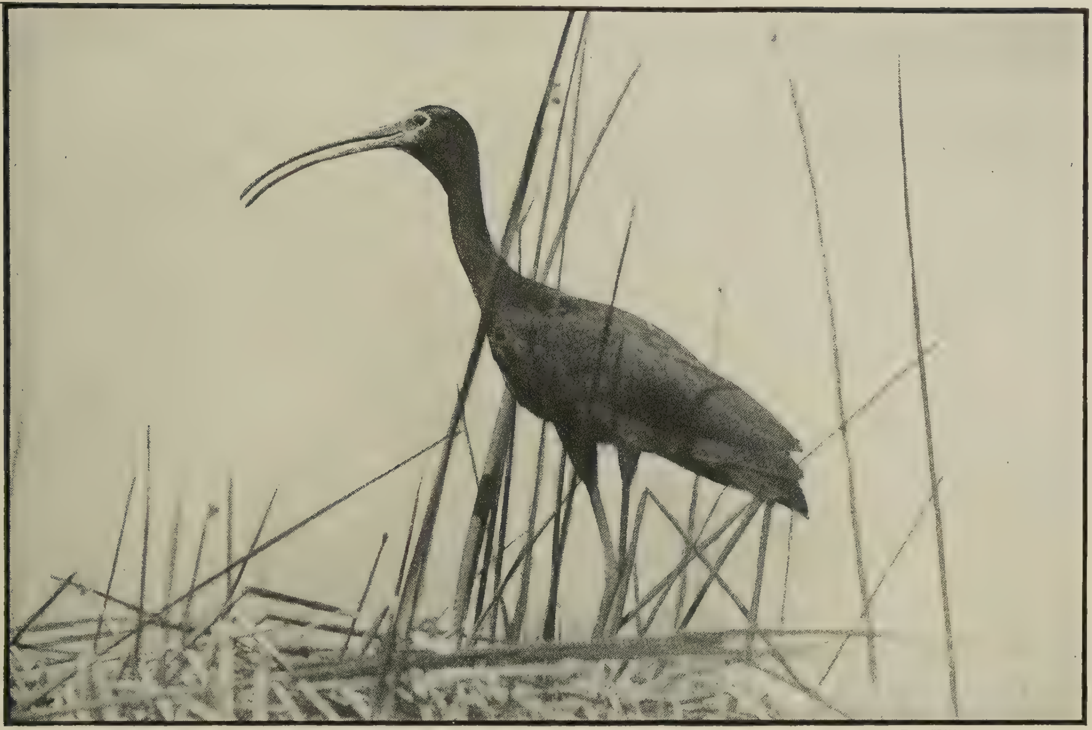
[1] By Warren F. Eaton.

[2] By Warren F. Eaton.



By William L. Finley

WHITE-FACED GLOSSY IBIS

in the body than a crow, and with long legs which stick out behind the tail in flight, and which the birds have to tuck up beneath them as they jump from the pond or marsh where they feed.

"Few people realize that formerly all these herons nested as far north as South Jersey. It has taken a long period to get them back, but recently for the first time since the destructive shooting began in the nineties, the little blue heron has nested as far up as Delaware, and the snowy heron as well as the egret and little blue have become regular summer visitors to New Jersey.

The Louisiana Heron.[1] "Another fine-looking bird associated with the others is the Louisiana, whose young are shown in the picture. They have always been more southern in distribution, but as numbers of herons increasingly fly north, some stragglers will be with them. When you see what looks like an adult little blue with white on the throat and under parts, you may be sure you have found this southern visitor.

"Heron flights arouse each year more and more popular interest, and seem to be becoming larger and larger. It is only a question of time, perhaps, if the good work continues, when many of the other species forming the luxuriant semi-tropical bird life of our country will spread again over much of the North and East. We hope so at any rate."

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[1] By Warren F. Eaton.

Courtesy of William L. Finley

WATER BIRDS ON OREGON COAST

Caspian terns and young, showing life in the colony; birds coming in to alight. Remarkable wing motion.

BIRDS OF THE SHORE

We are now far out beyond our dooryards, off, indeed, into what may be, and what in part must ever be, the primeval wilderness. The wildest place I ever saw was off the coast of Oregon, out on the wild bird rocks where the government has given to the gulls and cormorants, puffins, murres, and petrels, a protected home forever. The following is from an account of the trip which I wrote on my return:

"There was no breeze as we steamed along. The long, smooth swell of the Pacific swung under us and in, until it whitened at the base of three dark rocks that lay in our course, and that now began to take on form out of the foggy distance. Gulls were flying over us; lines of black cormorants and crowds of murres were winging past toward the rocks; but we were still too far away from the looming piles to see that the gray of their walls was the gray of uncounted colonies of nesting birds, colonies that covered the craggy steeps as the green firs clothed the slopes of the Coast Range mountains, up to the hanging fog.

"As we steamed on nearer, the sound of the surf about the rocks became audible; the birds in the air grew more numerous, their cries now faintly mingling with the sound of the sea. The hole in the Middle Rock, a mere fleck of foam at first, widened rapidly into an arching tunnel through which our boat might have run; the sea began to break before us over half-sunken ledges; and soon upon us fell the damp shadows of Three-Arch Rocks, for we now were looking far up at their sides, at the sea birds in their guano-gray rookeries—gulls, cormorants, guillemots, puffins, murres—incrusting the ragged walls from tide line to pinnacle, as the crowding barnacles incrusted the bases from the tide line down.

"We were not approaching without protest, for the birds were coming off to meet us, more and more the nearer we drew, wheeling and clacking overhead in a constantly thickening cloud of lowering wings and tongues. We rounded the Outer Rock and headed slowly in toward the yawning hole of Middle Rock as into some mighty cave, so sheer and shadow rose the walls above us, so like to cavern thunder was the throbbing of the surf through the hollow arches, were the flapping and screaming of the birds against the high-circling walls, was the deep, menacing grumble of the sea lions, as through the muffle of surf and sea fowl herd after herd lumbered bellowing into the foam.

"It was a strange, wild scene. Hardly a mile from the Oregon coast, but cut off by breaker and bar from the abrupt, uninhabited shore, the three rocks of the reservation, each pierced with its resounding arch, heaved their heavy shoulders from the waves straight up, huge, towering, till our little steamer coasted their dripping sides like some puffing pygmy. They were sea rocks, of no part or lot with the dry land, their beryl basins wave-scooped, and set with purple starfish, with green and pink anemones, and beaded many deep with mussels of amethyst and of jet, aglitter in the water's overflow; and just above the jeweled basins, like fabled beast of old, lay the sea lions, lumpish, uncouth forms, flippered, reversed in shape, with throats like the caves of Æolus, hollow, hoarse, discordant; and higher up, on every jutting bench and shelf, in every weathered rift, over every jog of the ragged cliffs, to their bladed backs and pointed peaks, swarmed the sea birds, web-footed, amphibious, wave-shaped, with stormy voices given them by the winds that sweep in from the sea."

ALONG THE BEACH

This extract from my account of the trip to Three-Arch Rock Reservation will give you some notion of the wildness and life offshore, and some notion of what you may expect along the beach in the wilder, rockier places. We can only stop here to look at a few of the commoner of these birds, interesting though they may be, as they play only a small part in the lives of most of us except as they pass over on their fall and spring journeys.

By William L. Finley

THE AUTHOR STROKING A MOTHER MURRE, SHAG ROCK, OFF OREGON COAST

The Sea Ducks, Geese, and Swans. You can scarcely find the place to put the duck, except, of course, in the water.

The family contains some two hundred species and is represented in all parts of the world. It includes five subfamilies: the mergansers or fish-eating ducks, the pond or river ducks, the bay or sea ducks, the geese, and the swans.

The mergansers or sheldrakes have narrow, serrate bills and are fish catchers.

The river ducks have little or no lobe or flap on the hind toe. They are the gadwall, shoveller, widgeon, pintail, blue-winged and green-winged teals, the mallard, black duck, wood duck, and others. All but the last three nest in the North, and are migrants. The mallard, black duck, and wood duck nest rarely in the Middle states. They feed by "dabbling."

The bay and sea ducks are divers, and may descend to the bottom in water more than one hundred and fifty feet in depth. They are to be distinguished from the river ducks by the presence of a flap or lobe on the hind toe; they are the redhead, canvas back, scaup, whistler, old squaw, eider, etc. They all breed in the North.

"The geese are more inland by nature than the ducks, as the great bulk nest in the far North about Hudson's Bay, in the Canadian Northwest, or within the Arctic circle, migrating southward through the Mississippi Valley basin to Texas and the Gulf states where they pass the winter. The Canada goose and the brant are the only ones we know along the eastern seacoast, but in the West the snow, blue, and white-fronted geese still come down by thousands. The whistling and trumpeter swans were once found throughout the country; but the latter is almost gone, although a few pairs still breed in Yellowstone Park and in the wilds of Canada. Of late years the strict protection accorded the whistling swan has made it common on Chesapeake Bay and Currituck Sound in the winter, and less rare as a migrant. A flock of swans in flight is a beautiful sight. In size they are to the geese what the geese are to the ducks. We may term them the "air express" as they sweep past on whistling wings. Another swan which may be confused with those just mentioned has been introduced in many parks and ponds, and has become wild in some parts of the East. This is the mute swan, pure white, of large size, but with a knob on its partly orange bill. The bill of the whistling swan is black. As these swans often call to one another in flight, it is sometimes possible to identify the wild birds at a distance."[1]

Gulls and Terns.[2] "The herring gull, so named from its habit of feeding on schools of the small herring in the spring, is the common 'sea gull' of our eastern rivers, harbors, and shore. In the West the California gull takes its place. There are a number of varieties also, such as the laughing gull, which nests on the marshy islands along our shores in the summer. It has a black head and bright red bill and when disturbed on its nesting ground often gives the loud boisterous *ha-ha-ha* which has caused its name.

"Gulls are great scavengers and very useful, although when too common in nesting colonies they may make a habit of robbing the nests of other species. One bird which is so persecuted is one of our most astonishing sea birds — the black skimmer with the long scooplike bill. Its lower section projects beyond the upper, as in the picture, and is useful to the owner as he skims the surface of the shallow coastal waters, opening the mandibles like a gigantic pair of scissors to scoop up his meal. Strictly speaking, the skimmer is one of the tern family which are smaller, slighter, and more graceful than the gulls. They have long deeply forked tails, pointed wings, and sharp bills which they point downward as they fly over the water in search of the small fish which are their prey. The common or Wilson's terns, known to fishermen as the 'mackerel gulls,' feed on small 'sand-eels' which they procure by diving, often disappearing beneath the surface of the water to make the catch. They sometimes gather in large clouds where the school of fish are thick, and drop *plop*, *plop* into the water a dozen at a time until the surface is ruffled and churned to a foam. Sand bars, low islands, and grassy ponds are favorite nesting sites; but as their enemies are numerous, their successful colonies are few. Strict protection by law and the setting apart of sanctuaries in favorable localities have brought back a fraction of the numbers which existed before their eggs

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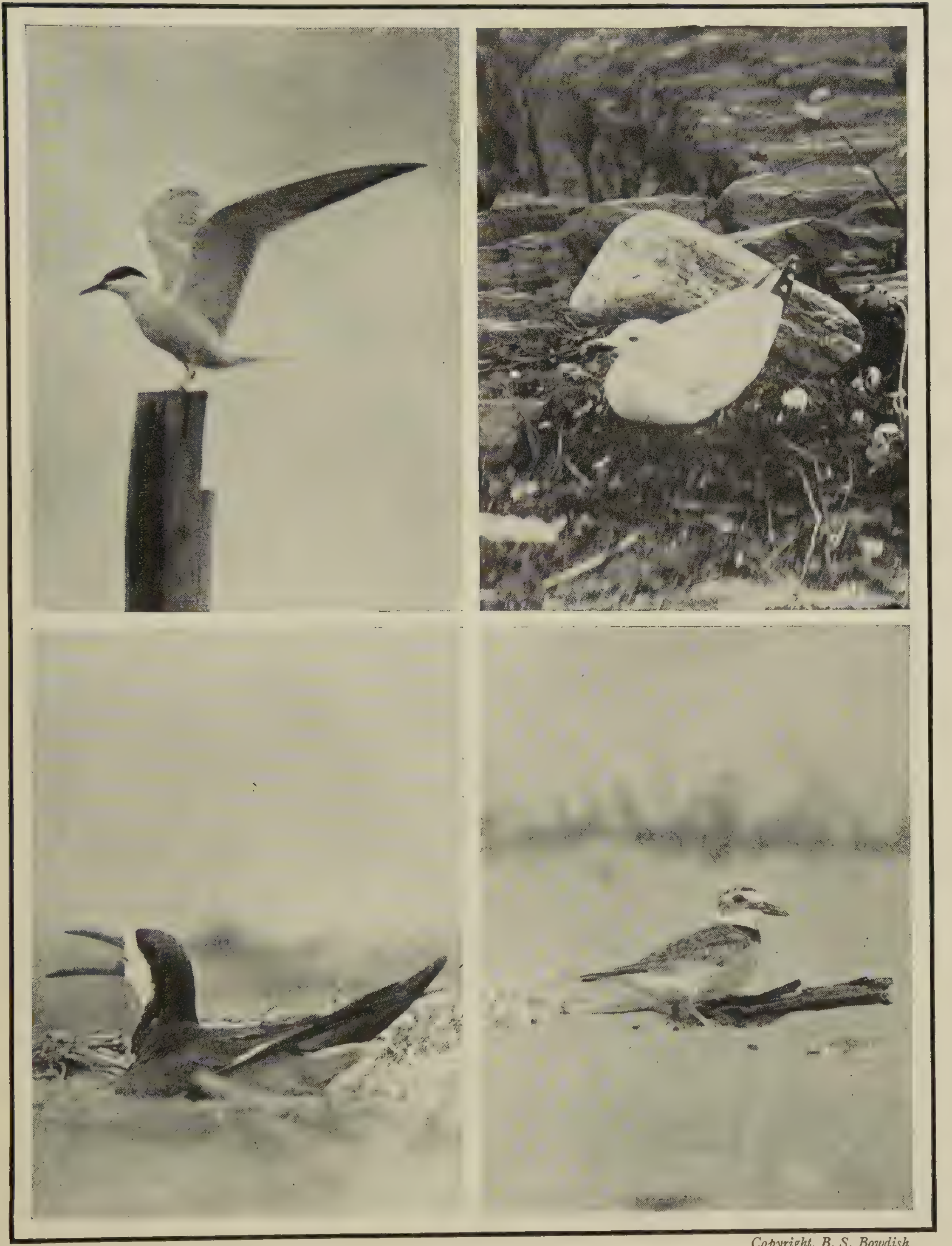
[1] By Warren F. Eaton.

[2] By Warren F. Eaton.



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SHORE BIRDS

Above: (left) The common tern, or sea swallow; (right) the herring gull, the common sea gull of the east, brooding its eggs. Below: (left) The black skimmer with beak open to show the longer lower mandible; (right) the Wilson's plover on its nesting ground.

were taken for food and their feathers and bodies for hats. Now this is illegal, but unfortunately on the out-of-the-way islands there are still a few misguided persons who steal their eggs on occasion. Besides the Wilson's tern there are the least, black (an inland species), Caspian, roseate, Arctic, and many others, all of great beauty and wondrous powers of flight."

The Plovers and Sandpipers.[1] "Most of the many varieties of these birds are for us spring and fall migrants. The killdeer plover with his two rings on his neck is one of the familiar sights to most farmer boys. The Wilson's plover nests on the Atlantic seaboard as far north as Virginia, and has only one band on his neck. The oyster catcher is a plover, a large bird with a long red bill which it uses to pry among the stones for its food. It is now becoming rare. The black-breasted, golden, and turnstone plovers are migrants; but the little piping plover with its plaintive whistle lives on the open beaches with the terns. It has a habit of decorating its nest, which is but a hollow in the sand, with bits of shells or bright-colored pebbles.

"Among the twenty-odd species of sandpipers which pass our shores, one of the few which nest (now very rarely) with us is the willet, a large, gray-streaked and speckled sandpiper with white under parts. The remarkable thing about him is that he is a very plain bird when he stands still, but when he raises his wings a zebra-like pattern of black and white stripes is shown. It is believed that this feature is of advantage in helping him to escape his enemies; for when he alights and folds his wings, the black and white bird disappears, and one sees only a gray bird, the color of the sand bar on which he stands. One of our most lovely and now rare shore birds is the upland plover or Bartramian sandpiper, which is a denizen of the sheep walks and hay fields of our interior farms. In the farming states you may sometimes see him from a train, fluttering on hesitating, quivering wings as he flits from one fence post to another, in alarm at the passing monster. He is the farmers' friend, feeding on bugs, worms, and beetles, but unfortunately growing scarce as he is shot for food by the natives of Argentine and Brazil where he spends the winter."

THE WILD GOOSE IN HIS FLIGHT

Let me take leave of the birds with the wild goose, for he is passing southward now as I am finishing this section. There is no more thrilling sight or sound to me in all the bird year than the passing of the geese.

"The wild geese breed in the low, wet marshes of the half-frozen North, where for many thousand years to come they will not interfere with the needs of man. They pass over our northern and middle states, and spend the winter in the rivers, marshes, and lagoons of the South. But north and south, and all along their journey back and forth, they are shot as they pass. For the wild geese cannot make this thousand-mile flight without coming down to rest and eat, and wherever that descent is made there is pretty sure to be a man with a gun on the watch.

"And what a flight it is! *Honk, honk, honk!* Clear in the silence of the frosty night drops their clarion call, like the sweet, faint notes of far-off bugles echoing round the starlit dome of the sky. *Honk, honk, honk!* Hear them beating down the long sky road close beneath the stars! One longs for wings to follow — to fly! fly! fly!

"*Honk, honk, honk!* Shall I hear them going over, going northward, as I heard them going southward this fall? Winter comes down in their wake. There is the clang of the cold in their trumpeting, the closing of iron gates, the bolting of iron doors for the long boreal night. They pass and leave the forests empty, the meadows brown and sodden, the rivers silent, the bays and lakes close sealed.

"Spring will come up with them on their return; and their *honk, honk, honk* will waken the frogs from their oozy slumbers and stir every winter sleeper to the very circle of the pole.

"*Honk, honk, honk!* Oh, may I be awake to hear you, ye strong-winged travelers on the sky, when ye go over northward, calling to the sleeping earth to waken, calling all the south to follow you through the broken ice gates of the north.

"*Honk, honk, honk!* The wild geese are passing — southward."[2]

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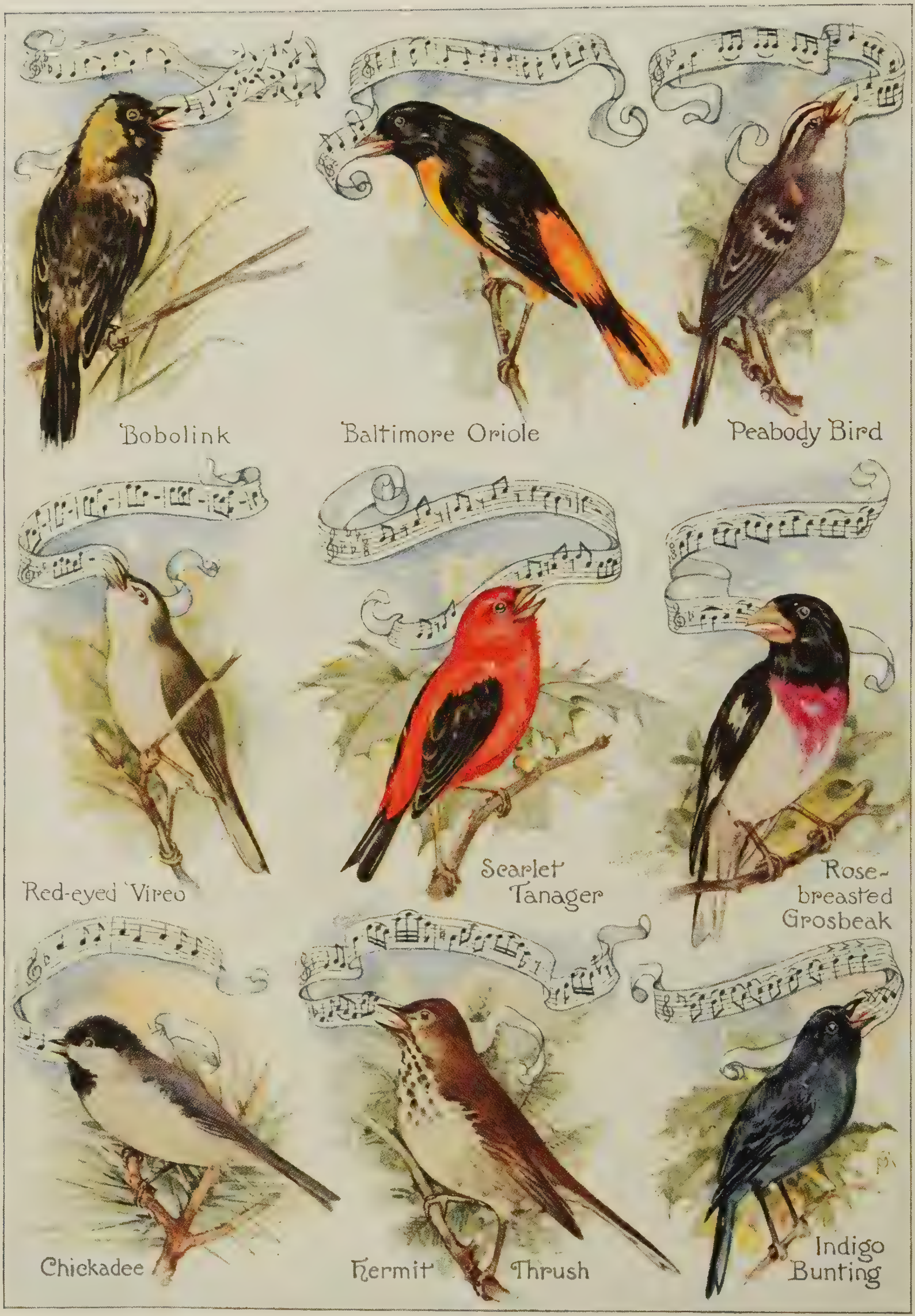
[1] By Warren F. Eaton.

[2] From Dallas Lore Sharp's "The Fall of the Year." By permission of Houghton Mifflin Company.



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SONGSTERS AND THEIR SONGS

The characteristic songs of familiar birds are given here in a color study by F. Schuyler Mathews, artist and noted authority on birds and their music.

BIRD SONGS

THE key to the song of the bird lies in the fixed form or rhythm which characterizes the music of the whole species. No two Robins, for example, sing exactly alike, but each follows a certain rhythmic form belonging to *all* Robins; that form is shown in fixed groups of three notes, rarely two.

The melodic Scarlet Tanager, though his song resembles that of the Robin, rarely sings in three-group notes, mostly they are two-group and slowly delivered. Again, the quality of tone is *not* like that of the Robin, it is buzzy or reedlike; to imitate it one must hum and whistle at the same time.

The Rose-breasted Grosbeak's song closely resembles the Scarlet Tanager's and it might be mistaken for the Robin's, but the differences are very distinct. It has a buzzing quality and it is uninterrupted, continuous, with a slightly rising pitch at its close. One does not find the notes easily separable into groups.

The Red-eyed Vireo's notes are separated in distinct clusters of twos, threes, and fours, and are rapidly delivered with an absolute pause before each group. This bird is an incessant and indefatigable singer all through early summer; he is always in the tree-tops and mostly out of sight.

The Chickadee confines himself to two even, sweetly whistled notes, ofttimes the second is split in two, resulting in one quarter and two eighth notes. There is practically no variation of these two set forms; his buzzing, chattering *Chick-a-dee-dee-dee-dee* merely informs you of his presence; it is scarcely music. He is surprisingly unafraid and friendly.

The Indigo Bunting sings like a Canary with ringing, swinging, musical chirps very high in pitch, the song ending with about three staccato, abrupt notes in monotone suggesting "*fish, fish, fish.*" One questions whether he sings for them or is their sales agent! His favorite stand is the topmost point of the steeplelike fir tree.

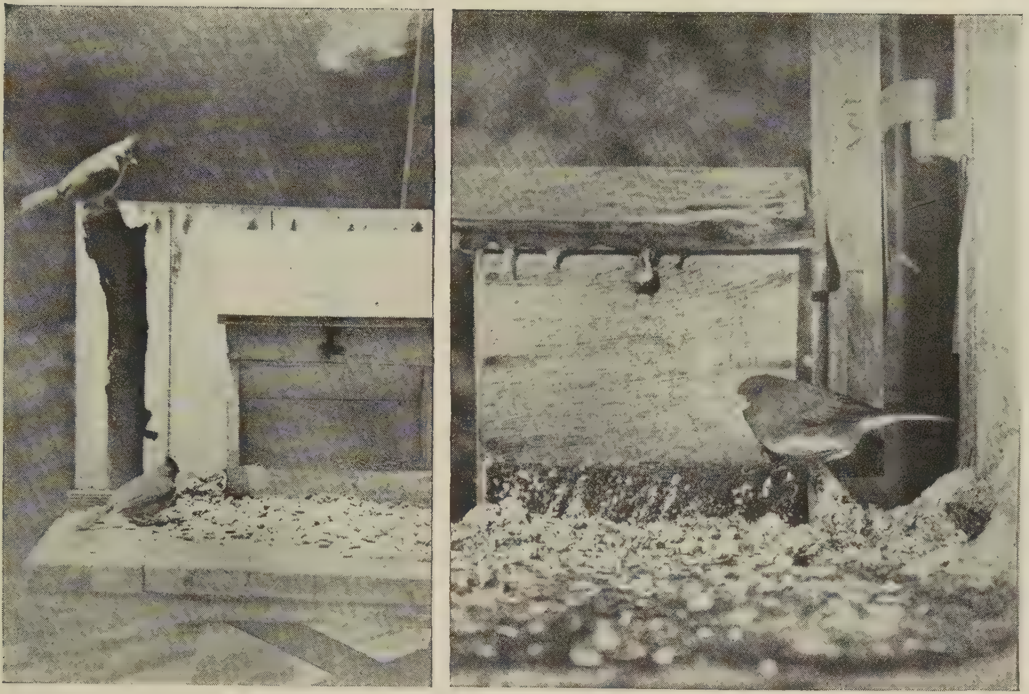
The meadow-loving Bobolink begins his rollicking song with four or five sober, steady tones, then hurries on with reckless speed until he goes all to pieces in a jumble of tinkling, glassy notes suggesting a music box gone wild!

The Baltimore Oriole is an artist whistler whose fragmentary motives are clearly delivered in emphatic staccato tones quite the opposite of the Robin's continuous warbling. There are no groups of three or two notes in the Oriole's song.

The Peabody Bird or White-throated Sparrow is another melodic singer. His first two or three clear-whistled tones are followed by three separate groups of three notes of one tone closely connected. There is no mistaking the rhythm; it is usually written "Old Sam Peabody, Peabody, Peabody."

The Hermit Thrush of our northern woodlands is the greatest singer of the skies, the Nightingale not excepted, for the Hermit sings on a definite scale. The music is that of a silver flute, the scale is pentatonic - the Scotch scale! It is best shown by the black keys of the piano. This wonderful Hermit is quite as faithful to that expressive and popular scale as is the old, beloved melody "Comin' through the Rye."

F. S. M.



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FEEDING-STATION VISITORS

The cardinal — see his crest! — and the junco

BIRD BANDING

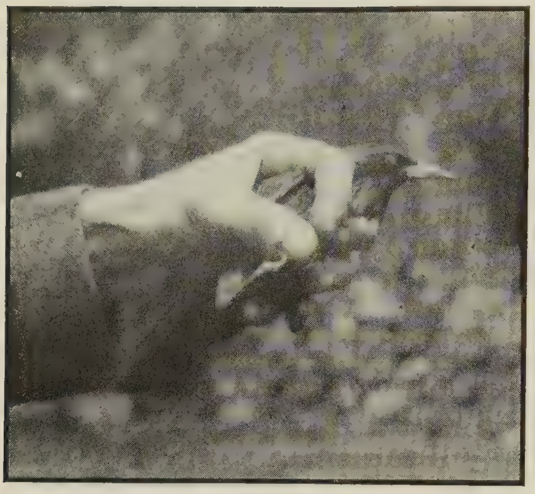
AN AID IN THE STUDY OF OUR WILD BIRDS

By Warren F. Eaton

HAVE you not often heard a person say, "Yes, we have a robin which builds its nest every year on the front porch" or, "We have a pair of jenny wrens which return year after year to a hole in the apple tree in our back yard"? But did it ever occur to you that we really know nothing about the *individual* birds about us, unless one has a white feather or a peculiarity such as deformed leg, for all birds of a kind look alike? We could not really prove it was the same wren or the same robin until the use of metal bands placed on the leg of a living bird has made it possible to check our observations and to put much of our knowledge, which was formerly guesswork, on a scientific basis.

Who first originated the idea of "tagging," or "ringing" as it is called in Europe, we do not know; but the first record dates from 1710 of a heron captured in Germany which had been banded in Turkey several years before. Various attempts were made at intervals in different countries, but nothing important was accomplished until Herr C. C. Mortensen of Denmark commenced in 1899 to tag storks, teals, and starlings. By 1914, Europeans had ringed about 170,000 live wild birds in Denmark, Germany, Hungary, Russia, Portugal, Sweden, Switzerland, etc. Much of this work was interrupted by the World War. In the United States the first bander was Dr. Leon J. Cole, who began in about 1900 and was instrumental in the founding of the American Bird Banding Association in New York City on December 8, 1909.

From 1911 to 1920 this work was continued by the Linnæan Society of New York; but as the number of people interested became so great and as the opportunity for scientific study



A STARLING

Note how he clings to the finger

increased, the whole project was taken over by the U.S. Bureau of Biological Survey, which has since become a part of the Fish and Wildlife Service.

At first, the bulk of those banded were little birds caught when too small to fly from the nest. It is fortunate that a bird's leg reaches practically its full size long before the bird is grown up, so that a band placed on a young one will not become too small as the bird grows, nor will it fall off if it is properly fitted. Experience has shown that bands must be of a soft metal resistant to rust, such as aluminum now used everywhere, and that they must be big or little to suit the bird for which they are intended. Each band contains a number pressed in the metal, also the address of the government bureau is given. At first thousands of bands were used on small birds; but the information sought for, that is, the future observation, or "repeat," of the individual bird, was not provided for. Unless by accident the young bird died and was picked up, or was shot and the band was taken, there was no way to check up again. Now as each bird is caught the bander marks its species, date of banding, age when known, sex when known, and other interesting facts on a card with a number to correspond with that of the bird's band. These cards are mailed to the Fish and Wildlife Service and when the bird is taken, either dead or alive, the facts can be reported to the Service and checked up with the original. The greatest forward step in this country was the discovery that by the use of the proper sort of bird traps the grown-up bird could be caught alive and banded without injury. Mr. S. Prentiss Baldwin of Cleveland, Ohio, was able to show that by continued trapping, the proportion of repeats and returns as compared to individuals banded could be greatly increased.

Almost innumerable questions can be asked which it should be, and is, possible to solve by banding.

Do birds marry for life?

Do the same individuals return to the same place year after year?

How old do birds live to be?

Where do the birds which nest with us in the summer go in the winter?

What kills our birds?

Where a given kind such as the song sparrow is present throughout the year, are the individuals which occur in summer the same ones which spend the winter, or are they replaced by hardier ones from the north?

How do plumages change?

How old are birds when they obtain their grown-up feathers?

Do birds nest when one year old?

Where do birds go when they commence their wandering after the nesting season?

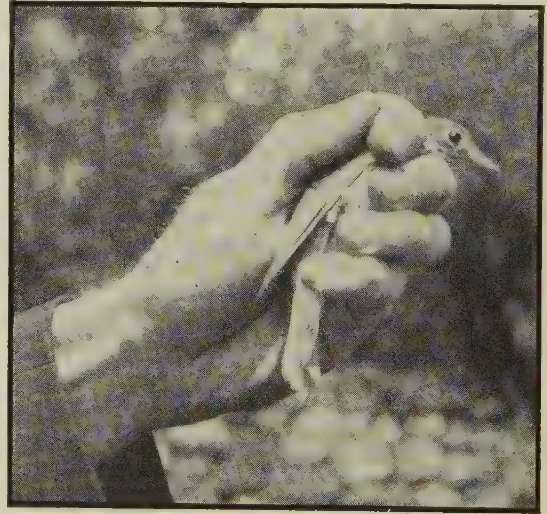


Photo by R. H. Howland

AN OVENBIRD

The proper way to hold a bird in the hand.

What are the more common migration routes used by the individual birds which migrate from a given section?

Who broods the young, the father or the mother, and do they both sing?

How many families does each pair raise a season?

When one bird of a pair is killed, does the other get a new mate?

In addition to answering these problems and many more, most of which it would be difficult to accomplish without banding and trapping, we may hope to obtain many details about the psychology and habits of individuals, about their weights, diseases, insect pests, and the colors of the fleshy parts in life.

A perfectly reasonable doubt may exist in the mind of an uninformed person as to the value of answering the above questions. We want to know such things because they add to the total of human knowledge of the world about us. The instincts of birds and of the lower animals are means by which we study many of the steps in the growth of our own way of thinking. One of the most extraordinary facts in the life of birds is their uncanny power of migration over thousands of miles of uncharted earth and sea without any experience to guide them other than an instinct or possible sixth sense. Several extremely valuable experiments have been made by a Canadian professor to determine the factors back of this migration urge. Bird banding will contribute to the completion of these experiments. Many of our greatest practical applications of scientific information have been made possible by men who have spent their lives in the study of "pure science" — in the search for truth for truth's sake. The study of how we think and its many complicated problems rests upon work carried on by experts who have watched in detail how animals and birds behave. Banders may hope to accumulate material of great interest to those who study instinct in birds.

Photo by R. H. Howland

YOUNG SPARROW HAWK

It tumbled down the chimney and now wears a ring.

So much has been discovered in the few years that students have banded birds that it is difficult to classify the material under regular headings. What may be true of jenny wren in her home may be absolutely untrue of the swan or the song sparrow. Birds, we find, have many enemies, and large numbers die before they get very old. The percentage of final returns, that is, of birds which have been killed, is very great with the hawks and owls and the ducks, many of which are shot. It is high also with small birds, as few attain the maximum age possible; but that birds may reach a considerable age is shown by the following table:

12 years	Pintail duck
10 "	Mallard duck, black duck
9 "	Canada goose
8 "	Screech owl, chimney swift, crow, junco, brown thrasher
7 "	Green-winged teal, snowy egret, black-crowned night heron, flicker, crested flycatcher, white-throated sparrow, rose-breasted grosbeak, chickadee.[1]

Many more kinds of birds often reach ages up to seven years. It is probably safe to say that the natural life of a small bird is less than that of birds of a larger variety; but we cannot be sure of the proportion as the small bird has more enemies than the larger.

Banding revealed very promptly a peculiar and sometimes fatal disease which attacked the feet of chipping sparrows especially, as well as of several other kinds of birds. Such different birds as the pheasant and the cowbird were found to be afflicted fatally by tuberculosis. A number of bird parasites were found

[1] See note on following page.

to be peculiar to certain species and in many cases to kill the young birds in the nest.

Among the facts about migration is the discovery that individual birds of many migratory kinds tend to return home each year. This conclusion has been reached in the study of the white-throated, tree, and chipping sparrows, the junco and the evening grosbeak, which are especially regular in returning to their winter homes. Mr. J. T. Nichols writes very completely on this point. He says that individual birds of various migratory kinds tend to return to the exact nesting or winter stations. That the same does not hold for half-way points argues that such lingering as they do on northward or southward passage is of a more casual kind, and even suggests that individuals do not follow the same route repeatedly with a memory of its landmarks, but rather follow various routes governed by a "sense of direction." If this be true, the finding of great numbers of birds in migration along coastline, river valley, and the like calls for explanation. Whether it is right or not, one explanation is that the country along such highways is usually comparatively favorable for a migrant to make chance stop-overs. A river valley will, as a rule, feed the passing hosts better than a rocky hillside; and land birds, which on striking the coast, follow along it, will be better placed when breakfast time comes than if they had (unnecessarily) flown out to sea.[1]

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A BIRD IN THE HAND
The white-breasted nuthatch

In the study of wintering sparrows it became obvious that groups of individuals of varying number seem to arrive and depart together and to feed in a loosely knit flock. Theory and investigation seem to prove that these are families of locally related birds, and that they winter and nest in the same neighborhood. In general, British naturalists, who have banded many birds as nestlings, have found that they return to the vicinity of their birth to raise their own families. As the number of pairs of a variety present in one locality depends on the food supply, it means that unless the death rate is very high the successive nestings of the group will make their homes spread out in different directions from the common center. By such increases a species widens its natural nesting area unless stopped by some natural or artificial condition which is harmful to its increase. Normally, however, it seems conditions remain about the same due to the greater death rate of the young birds.

Evidence of migrations and wanderings on the part of all-the-year-round birds like the hairy woodpecker, the blue jay, and the white-breasted nuthatch, proves unexpected. At one place there was an arrival of migrant blue jays in winter from some other locality which later stayed to nest, seeming to indicate that occasionally pioneers transfer their homes from one place to another.

Accurate weighing of live birds of the same species shows a great variation in weight, as in human beings. All robins may look alike, but they vary somewhat in size and considerably in weight.

Perhaps the most widely discussed side of banding is set forth in the article by Mr. Baldwin on "The Marriage Relations of the House Wren."[2] He found that not only did the first pair of wrens which raised a brood together, separate and take new mates for a second brood, but that this is a somewhat habitual affair with wrens. Naturally, the discovery of the same condition of affairs with the brown thrasher and the bluebird, caused people to think that the majority of birds are unfaithful one to another. Further investigation, however, has shown that especially with the song sparrow, catbird, and cardinal, the birds stay married

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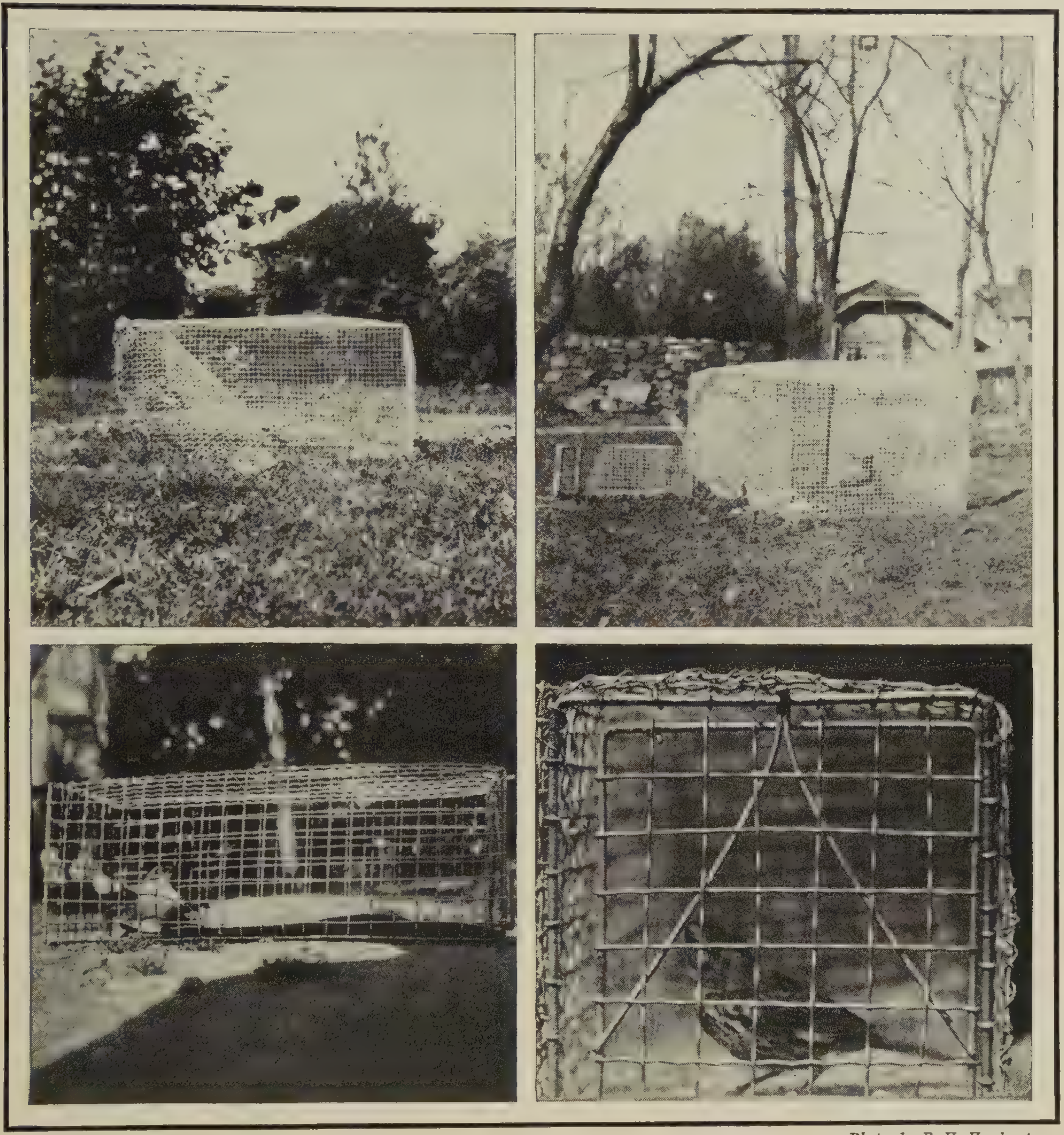
[1] *The Age of Banded Birds* by J. T. Nichols. Bulletin of Northeastern Bird Banding Association, p. 142

[2] *Auk*, Vol. 38, pp. 237 ff.



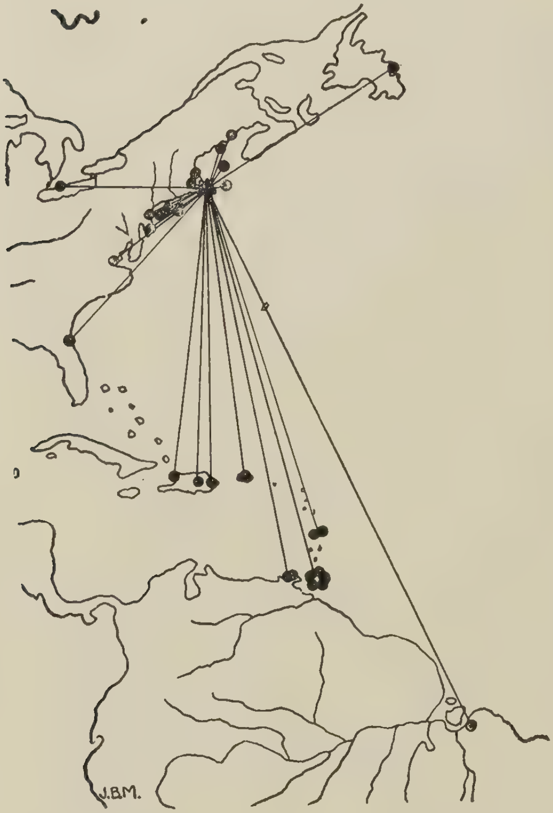
Photos by R. H. Howland

BANDING CAGES

Above: (left) An ordinary sparrow trap with funnel entrance; (right) a trap with sliding door operated by a string. (This robin was caught in the same spot the year before.) Note the small gathering cage at the left. Below: (left) A catbird in the cage. (The small cage is used to transfer birds from a large trap to the hand); (right) Song sparrow in gathering cage. (Without the use of these a bird escapes easily.)

throughout the season. In fact, about three-fourths of those studied have not changed husband or wife for the second family. Unless the birds depart from their local area right after nesting, the chances are that, barring accident, they will remain together for the season, but in general few remain "married" for life. When one mate is killed or disappears, it is generally replaced in a few hours by a second "husband" or "wife" without affecting local families. This happens so often that it indicates there are many unpaired individuals of common varieties in the neighborhood which are only looking for the chance to get a family of their own. The study of "returns," that is, of birds which have migrated and been recovered, in order to show where they went, is one of the extraordinary departments of banding investigations.

Probably the most startling example is that of an Arctic tern which was banded in Labrador, North America, and was recovered in Natal, South Africa, in less than ninety days — a distance of eight to nine thousand miles. So many black-crowned night herons and common terns have been banded in New England and recovered that the Biological Survey has been able to plot three southward routes for the terns, and to show that the herons migrate in practically all directions after the nesting season, presumably to reach places with a better food supply. European observers have been able to establish the approximate distance a bird will cover in a day on migration and to make very good estimates of the speed attained. Recently an ingenious method has been worked out so that by using colored bands placed in certain ways on the bird — for example on right or left leg, one color above another — it has been made possible to check local birds about feeding stations by sight. Observers can then record the day-by-day and hour-by-hour activities of the birds.

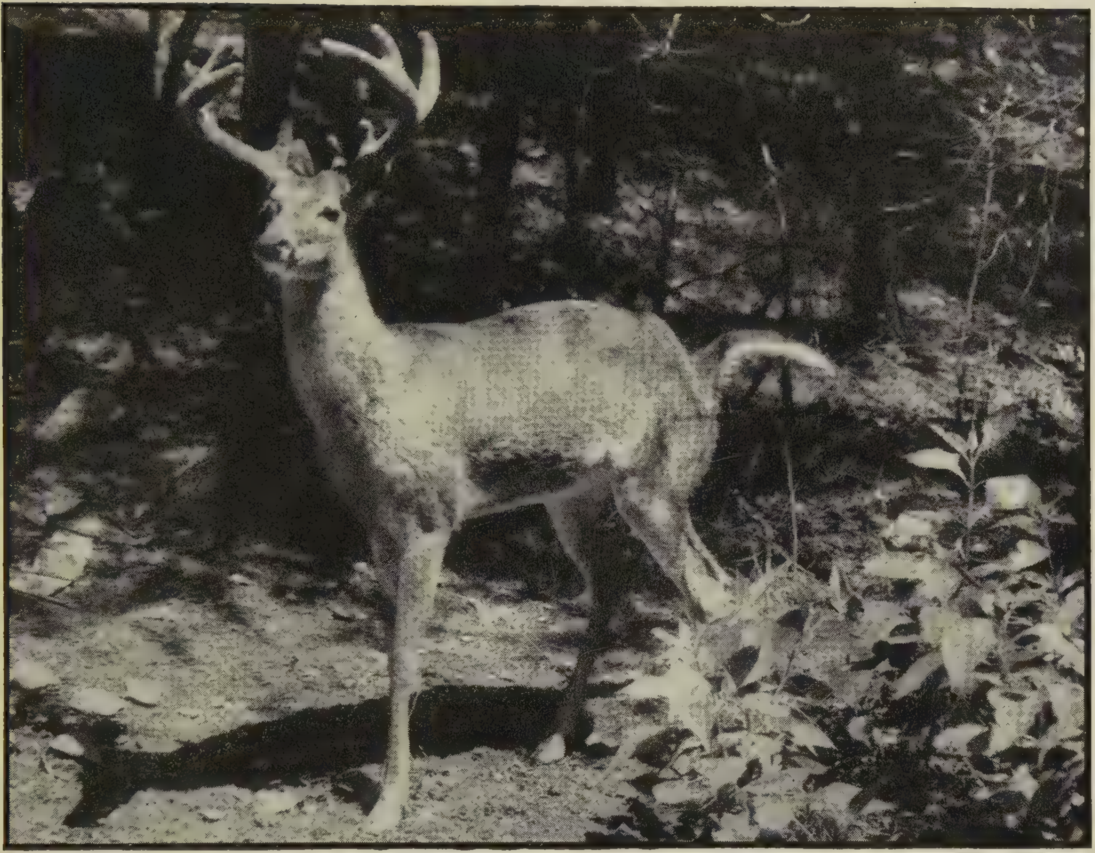


MAP SHOWING PLACE OF BANDING AND RECOVERY LOCATIONS OF COMMON TERNS

This Map is by Dr. John B. Mayor, and is used through his courtesy.

Most banding stations start as feeding stations. A banding coöperator must be familiar with all the kinds of birds about his station, as no bird should be banded unless carefully identified. A permit from the National and State authorities is required on proof that the observer is qualified. When birds are feeding, bathing, and nesting normally about a locality, the banding becomes a matter of skill in the use of proper traps, choice of the right kind of bait, and patience on the part of the coöperator. A great many sorts of traps have been invented; regular ground-drop or spring traps, nest-box traps, nets which entangle flying birds, water-drip traps, tree-trunk traps for woodpeckers, chimney-traps for swifts and the like, and large enclosures for ducks and water fowl. A favorite method to catch a large number of individuals is for a group of banders to visit a tern, skimmer, gull, or heron colony near the water where both old and young birds can be caught rapidly. Most people maintain winter feeding stations and catch many in this way. The banding very rarely does the bird any harm when the coöperator is careful; and the usual result is to concentrate many birds about the artificial food supply where the station is maintained. There are now hundreds of people studying birds by this means every year all over the world, and the sum total of technical knowledge is increasing by leaps and bounds.

If you are not equipped to become a bander yourself, there surely is some station in your neighborhood where you can observe the work. The U. S. Fish and Wildlife Service will be glad to answer your questions about bird banding and tell you how you can help.



A FINE PICTURE OF A WHITE-TAILED VIRGINIA DEER

THE NATURE LOVER'S CAMERA

By Dallas Lore Sharp

NO one of us can know everything or do everything — not even everything suggested in the pages of this single book. You will have your way of observing Nature; I will have mine, and our ways may not run parallel at all; but, if both our paths lead to the open out-of-doors, then well and good.

Personally I know very little of the use of the camera. I never owned one — I had almost said, never "shot" one. I have done that, but I got no picture, so far as I know, for the shooting. Now if you have a camera and enjoy using it, then I recommend strongly that you take it into the field and woods for Nature work.

When one sees the work done among the birds and animals by William L. Finley, Herman T. Bohlman, Frank Chapman, A. R. Dugmore, and others, it is very plain that here is a kind of hunting that will tax the patience, ingenuity, and wit of the keenest woodsman and bring to light a multitude of interesting facts that the human eye is hardly quick enough to perceive or the memory lasting enough to record.

But let me quote the words of Mr. Dugmore, than whom there is no greater authority, if experience with a camera and successful work give authority. He says:

"As a means of studying Nature in most of its many forms, there is, perhaps, nothing better than the camera. Not only does it teach us to see much that would otherwise pass unnoticed, but it enables us to make records

YOU CAN LEARN TO TAKE NATURE PICTURES LIKE THESE

of what we see — records that are, as a rule, infinitely better and more useful than pencil notes; and the studying and photographing of one subject lead to another, and so we go from birds to insects, from insects to flowers, and from flowers to trees, until we have an acquaintance with things natural more intimate and far broader in its scope than would have resulted had we been content simply to try to see things and write notes on them.

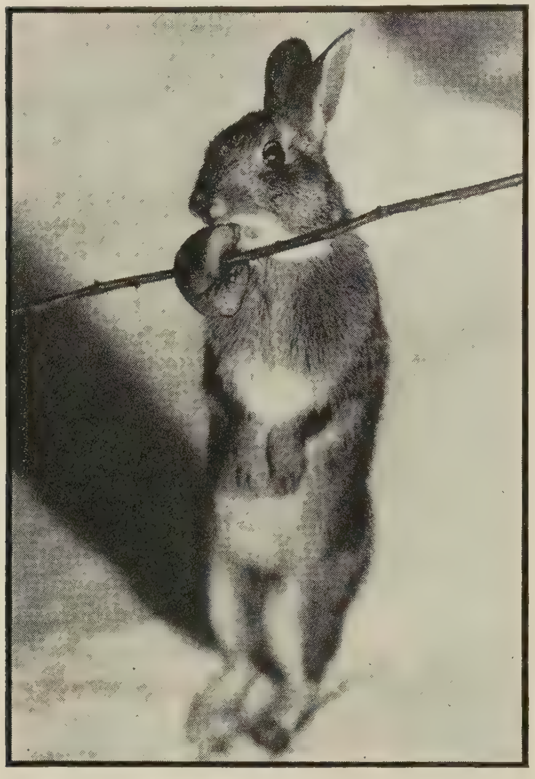
"Nowadays, when every school has or should have its Nature class, we find children scarcely out of the kindergarten who know more about our wild birds and flowers than the great majority of the grown-up people to whom Nature study was an unknown thing when they were young. To foster this desire in children to know more of the life about them is one's duty, for not only is there great pleasure to be derived from such knowledge and healthful

— AND LIKE THESE

exercise in the search of material, but knowing something about the birds, trees, or insects enables them throughout life to work intelligently for the preservation of that which needs protection.

"Game laws would undoubtedly be respected more generally if people would only realize what they mean. The senseless and wanton killing of animal life that goes on all around us would not be tolerated if there was more knowledge of the value of such life. How often do we see people kill hawks, thinking that they are doing a good deed, just as the various Christian sects killed one another in days gone by, fully believing that such acts were for the good of the world. Let the man who kills a hawk or even a snake first inquire into the habits of that particular kind of hawk or snake, and usually he will find that by killing it he will be doing harm to his own interests.

"Thus it will be seen that there is much to be gained by encouraging the study of Nature in any or all her forms, and, as has already been said, there is nothing that will give the beginner an interest in the subject any more quickly or with greater certainty than the camera. Nearly everyone, young or old, possesses some variety of camera, and yet so few ever attempt the portrayal of anything save people and views. Let them direct their energies toward photographing the details of almost any common object in Nature, and they will be astonished to find how much there is to interest them in that object. Take a photograph of a landscape, and even though it may be beautiful, it is, after all, much like hundreds of other landscapes. But take any one of the objects represented in the view, such as the different grasses, the flowers, or the trees, and how much more interesting would they be if well photographed in detail!"



TAKING HIS OWN PICTURE

The camera was focused on the bait and after dark the shutter was opened. When the rabbit nibbled at the apple he set off a flash bulb and took his own picture.

Speaking of the excitement and interest of wild-animal photography, Mr. Dugmore says:

"Few of the vast army of photographers realize what it is to hunt wild animals with their cameras; still fewer of the sportsmen appreciate the amount of sport which may be had when the camera takes the place of the rifle. They don't consider that for the camera there is no 'close' season. Game of all kind — and all animals are the camera's game — may be hunted with more or less success at all seasons of the year. If we consider the skill required for camera hunting, we must realize that more is needed than when the gun is used; for it is necessary not only to approach nearer to the animal, but, even when near, hours may be spent in trying to secure either a favorable place or a suitable attitude, and during all this time every precaution known to the hunter is called into practice. Stalk a deer with the camera and you will realize how small a thing will mar the chances of success. A twig incautiously broken, the grazing of the camera against a dry branch, or any of the hundred and one accidents that may at times happen to the still-hunter, and where is your photograph? Gone! Whereas had you been using the rifle you might easily have bagged your game. Stalk a big bull moose, even though it be during the close season, and unless you by chance find an animal that is absurdly tame, as occasionally they are, you will find excitement enough if you would come within fifty feet of the big creature. Learn all you can about still-hunting, do not relax your vigilance, and take nothing on chance, and you may succeed; fail in any one precaution, and you will have no picture."[1]

Such work will make you steady of nerve, will give you courage and patience and caution, and will bring you very near to Nature — nearer than most persons can get without this desire of the photographer to take a difficult picture.

Your little woods and meadows, waysides and even dooryards, will yield you material for years of watching and picturing. Skill and judgment will come with experience. The way to begin is — begin!

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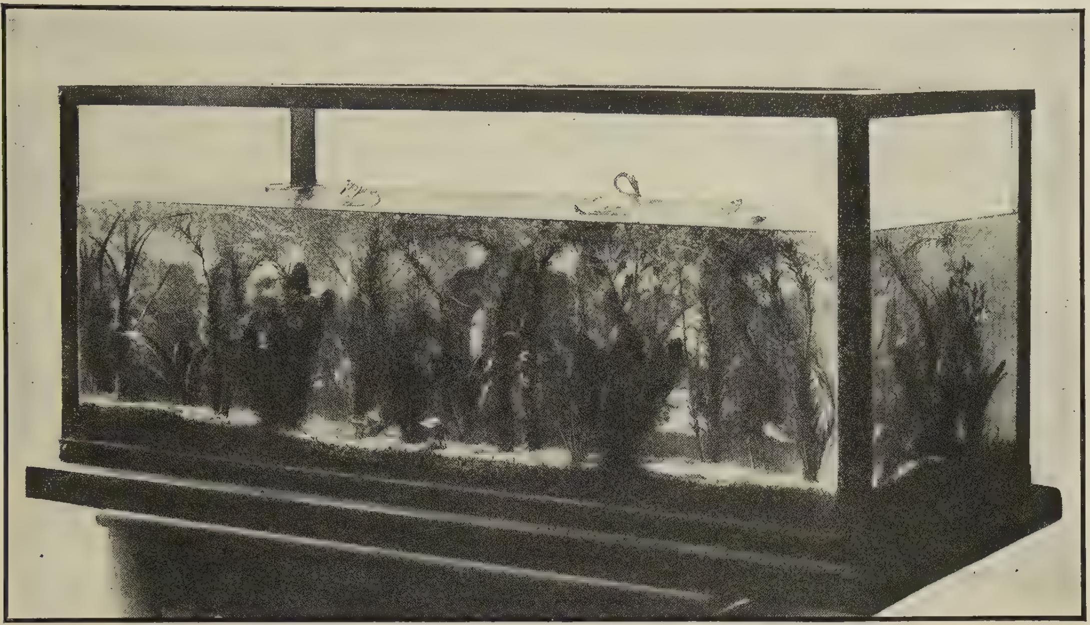
[1] From "Nature and the Camera" by permission of Doubleday, Page & Co.



THE SQUARE AQUARIUM, WITH ITS FOREST OF PLANTS FOR THE FISHES TO SWIM AMONG

THE NATURE STUDENT'S AQUARIUM[1]

"OF all living creatures that are kept for amusement, ornament, or as pets, I know of none that require as little care as goldfish and others adapted to the aquarium," says Mr. Chester A. Reed in his valuable booklet, "Goldfish Aquaria and Ferneries."[1] "The first cost is low, and the cost of maintenance but a trifle. You can go away and leave them for a week at a time without worry as to their welfare; they are always in motion, and become very tame, and make no noise to tire sensitive ears.

"In the keeping of fish and other fresh-water life, the first thing for our consideration is the receptacle for the water. Anything that will hold water will make an aquarium, but since our object is to see the fish and have an artistic ornament in our home, we must have a vessel with glass sides.

"Globe aquariums make very handsome ornaments, and, if one cannot afford a more expensive form, he should certainly have one of these. The objections to this form of receptacle are that the shape magnifies and distorts the fish, and the rounded sides make the arrangement of the plant more difficult and less artistic.

"Fanciers usually regard the all-glass square as the best and most satisfactory form of aquarium that can be had. It is also the most expensive tank, excluding fancy iron ones with fountains, vases, etc. These aquariums are pressed and molded of clear white glass. They are strongly made and, of course, leakage is impossible unless they are broken accidentally; they will stand quite a heavy blow, too, without breaking. A square tank is also made of green or bluish glass. These were originally intended for battery jars, but they are often used as aquariums. Of course they do not compare in appearance with the white glass ones; neither do they cost as much."

THE SQUARE AQUARIUM AND ITS USES

For our Nature-study book, the square form is the only useful one, both from point of view of size and naturalness of things seen through its sides. Here is room for a variety of forms. In Mr. Robert Bruce Horsfall's square aquarium I have seen minnows, frogs, turtles, newts, snails, and whirligigs together with several fresh-water plants and algæ, all living happily together, some of them so trained by the artist as to come to the surface of the water in order to take crumbs and flies from his fingers.

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[1] By Dallas Lore Sharp. [2] Published by Doubleday, Page & Co. Used by permission.

One of the peculiarly interesting possibilities with the aquarium is found in the chance it offers to make friends with an order of life very humble, very much lower indeed than is found in the dooryard or about the farm. Everybody loves a dog, but a dog is the most highly developed animal in all the world from the standpoint of capacity for human companionship. Anyone can love and understand a dog. But a turtle, a frog, a water beetle — how few persons have the patience, the fineness of feeling and touch, and the real love for all wild life that would make it possible for them to be so interested in the life of some particular whirligig as to win its confidence and friendship!

Your chickens know you when you rattle the corn in the measure and lift up your voice for them. So will your tame tadpole and salamander, and even the water beetle in your tiny pond world on the table if you will live with them long enough and feed them often enough — if, in other words, you come to love them.

CARING FOR THE AQUARIUM

But before we take up the special studies and forms for the aquarium, let us have the few simple rules for caring for the aquarium. And here again let me quote authority. Mr. Reed, whose book I have just cited, says:

"The average person that keeps goldfish has a jar of water containing one or more fish. Such an outfit does not constitute a true aquarium. After a few hours the fish will come to the surface and swim about with their mouths protruding, gasping for air, and the water must be changed.

"Fish breathe air the same as do human beings and all other animals. Fresh water contains air in suspension; the colder the water the more air it will contain. The gills of a fish are so constructed that it can breathe the air or oxygen that the water holds. In a small vessel the fish soon exhaust this oxygen and must come to the surface to breathe and, if neglected, will soon suffocate. Changing the water, of course, remedies this for a time; it can also be aërated by dipping some of the water up in a cup and letting it fall back into the globe, taking air along with it. By continuing this a number of times the water can be made as fresh as ever. If this were necessary, however, the difficulties of keeping fish would be such that few would care to attempt it."

THE USE OF PLANT

"Nature has provided a way for replenishing the supply of oxygen in pond water so that the aquatic animals may thrive, even though there be no springs or currents to furnish fresh water. This is found in the quantities of vegetation or plant life that grows under water. Animal life and vegetation under water are very similar to those on the land except, of course, that the inhabitants of each are specially adapted to their own spheres."

All animals take oxygen from the air and exhale carbon dioxide or CO_2. Carbon dioxide is necessary for the growth of plants. It is absorbed through the leaves and, under the action of light, it is broken apart, the carbon entering into the structure of the plant while the oxygen is set free.

The same thing takes place under water, the plant changing the carbon dioxide into oxygen for the fish. Therefore, by putting water plants into the aquarium we can form a little natural pond. Mr. Reed also says:

"A vessel holding two gallons or less of water can easily be arranged with proper amounts of animal and vegetable life so as to go two or three weeks without renewing the water. In larger tanks you carry the similarity to a natural pond still farther and introduce scavengers such as snails, tadpoles, clams, etc. Aquariums so arranged are called 'balanced.' The nearer you can get to a perfect balance in any aquarium, the less care it will be for you and the better it will be for both fish and plants."

A CAR OF AQUARIA

A most interesting illustration of the need of air in water is seen in the transportation of young or fingerling trout and salmon from the hatcheries to the distant creeks and rivers. One summer I was with a car load of fish that started from the hatchery at Bonneville on the Columbia River, Oregon, for the far-away farm of Burns in southeastern Oregon. From the hour those fish were ladled into the large ten-gallon milk cans, ladlers stood over them dipping up the water and pouring it back bubbling into the cans in order to carry the air into the absorbing water.

The fish car was delayed at The Dalles, then sent on to Bend, where an automobile truck met it and carried those cans of little fish on across the High Desert of sagebrush and sand to Burns — three days and two nights on the way, and those two men dipping, dipping without rest or sleep on the rails and on the desert trail, and then the fish arriving dead — for the lack of air!

Since then special fish cars have been built, fitted with cans and siphons and automatic aërating apparatus, which can carry thousands of fingerlings over the long hauls of that vast state and give them all the air they can breathe.

THE AËRATING PLANTS

Go to your own ponds and streams where you get your minnow and other aquarium life and hunt about for yourself for small green plants under water, discovering if possible (and surely it is possible) upon your own investigation what plant life there is at hand that will keep your water pure. Never let the books and the teachers do things for you that you can do for yourself.

In your neighborhood pond there are live things. It is pretty certain that that pond grows its own aërating plants. You discover them.

In our weekly trips for bathing and bug hunting along the sand and rocks at Nantasket Beach, the small boys were not all summer discovering which one of the algæ made a good salt-water aërator. Here on the window sill sits a jar of sea water with starfish, limpets, whelks, periwinkles, and other small things in it that has been kept pure and clean for *two* months by a little clump of green algæ gathered from the low-tide rocks. Always select the *green* algæ and pond weeds for the aquarium.

INTERESTING STUDIES YOU CAN MAKE WITH AN AQUARIUM[1]

THE STICKLEBACK'S NEST

I KNOW of nothing in all outdoor life more interesting than the domestic affairs of the animals, and among all of those who build nests none are more curious, more surprising and unusual than the nest-building fishes. Domestic life among the fishes is strange, according to our notions of domestic life anyway, for it is Father Fish usually who takes household affairs seriously and looks after the children.

Get four or five small sticklebacks and watch the ferocious little lovers through their family troubles. They begin in the spring with quarrels among the rival lovers. If there are two rivals in the tank, each will take an end and fight to hold it against the other. To quote once more from Mr. Reed's book:

"The contests of the lovers when they meet on neutral grounds are very amusing. Rapid transformations take place in their coloring during their angry bouts that are as wonderful as the change in the colors of the chameleon.

"Each male will select the place for his nest, and, unlike that of the paradise fish, theirs is built on the ground and is composed of shreds of vegetation cemented together with their glutinous saliva.

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[1] By Dallas Lore Sharp.

"First a little hollow is excavated in the sand under the shelter of a plant, the male taking each grain of sand in his mouth and carrying it to one side; then he visits all the vegetation, finding material that is suitable for the nest proper.

"The nest is about one and one quarter inches in length and has a hole in the center, shaped like a lady's muff. The nest completed, the little lover starts out in search of a mate. If there are several females in the tank, the male will probably induce more than one to lay their eggs within his little nest. The eggs once deposited, no fish is allowed to approach the nest, for the owner keeps on guard continually, and keeps the water circulating through the nest by fanning it with his pectoral fins.

"The young fish are very active, but the father keeps them within the confines of the little home until they are a week or more old. Every time one escapes he will either drive it back or carefully seize it in his mouth and replace it. After breeding, the fish lose their brilliant colors and are a uniform grayish-brown or blackish.

"Sticklebacks are not long-lived fish, two or three years apparently being about as long as they can be kept in confinement. Their food consists of minute water insects and crustacea. In confinement this diet can be augmented with very small pieces of raw beef."

THE TADPOLE'S TAIL

Another and very different study can be made with tadpoles. You can watch them from No. 1 stage to No. 5 stage — from eggs to fishlike creatures with tails and gills to full-grown four-legged frogs that spend their time largely in the open air. Nothing in animal life and growth is more astonishing than this series of changes. Mr. Reed says that tadpoles are necessary in any aquarium, because they keep the water clean, as their staple food is the refuse. There are a number of kinds of tadpoles and not all are good for the aquarium, he says. The tadpole of the toad is not so useful as that of the frog, because it develops too rapidly. They cannot readily be distinguished by the novice when they are in the tadpole state, although they are usually much darker than those of the frog. Toad eggs can readily be distinguished from those of the frog, as they are laid in a curling, stringy, jellylike substance, stretched between water plants, while those of the frog are laid in compact masses. The toad eggs hatch in about four days into tiny coal-black tadpoles, which in about two months more leave the water as full-fledged little toads, hardly an inch in length.

Frog tadpoles can be secured from ponds with the net, or they can be raised from the eggs. The eggs are laid in large masses and may be attached to plants or simply floating. A single female frog will lay upwards of a thousand eggs. In about ten days the young tadpoles appear, curious little creatures with an enormous head and a wiggly tail. After the first two weeks these tadpoles swim about a great deal, rarely being still; they eat quantities of food and grow quite rapidly. The tadpoles of the leopard frog, one that is often found in moist fields, change to little frogs during the same summer the eggs are laid, while those of the common bullfrog do not change until the following year, and sometimes not for two years. Consequently those of this variety are the best for use in the aquarium. These bullfrog tadpoles grow to be exceedingly large, sometimes being seven or more inches in length before they develop their fore legs. After they have become frogs they should be liberated or else kept in a separate aquarium. As it is necessary for frogs to be out of water part of the time, means to do so will have to be provided. They can be fed upon small pieces of beef, earthworms, or insects.

VARIETY IN THE AQUARIUM

The nest-building sticklebacks and the tail-changing tadpoles are only two of a score of creatures, each with its own peculiar life and habits, that you can watch in the aquarium as through some magic window into the underwater world. Follow your own bent, make your own suggestions, and let your little water house, like some great city hotel, become the hostelry for many guests, of many kinds, and the home, the real home, of the tiny folk of the streams and pools that you would otherwise never come to know.

THE LUNA MOTH, A PRIZE HIGHLY VALUED BY THE COLLECTOR

THE NATURE STUDENT'S INSECT COLLECTION[1]

INSECT STUDY IS IMPORTANT

NO other family in the whole world of animal life is so numerous, so various, so widely distributed, so economically important, and, to those who know the family, so interesting as the insects. If you divide the whole animal kingdom into two sections, namely, those having no backbone, the invertebrates, and those having backbones, the vertebrates, then among the backboneless animals you will place the insects highest up on the scale, next after the backboned animals, giving them the most important place.

THE NUMBER OF INSECTS

When you stop to think that there are several million species of insects, forming about two thirds of the entire animal kingdom, their importance in the world begins to be understood. But when you stop again to think that in this country alone insects destroy about two billion dollars worth of produce every year, you hold your breath — no, you don't, because those figures are so vast that you can't at once comprehend them.

If they do that immense amount of damage, they also do more than that many dollars' worth of good. For our fruits, melons, and all the things we grow in the ground depend in part upon insects for their life, because it is the insects largely that carry the pollen dust to fertilize the flowers — clover flowers, cucumber flowers — and cause them to yield seed.

MOSQUITOES AND STABLE FLIES

But this is not all. It is the wretched mosquito that carries malarial fever and injects the terrible germ directly into our blood; it is the stable fly that does the same with the more terrible germ of meningitis, that causes paralysis and death.

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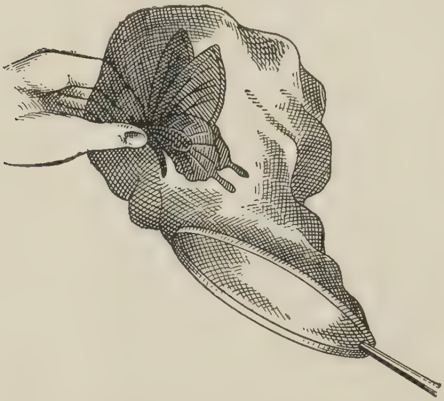
[1] By Dallas Lore Sharp.

Insects eat our carpets and clothes — and also give us silk for our clothes; they spoil the walls, torment us and our cattle, and make certain sections of the world at times almost uninhabitable.



ONE METHOD OF KILLING A SPECIMEN, BY PINCHING THORAX THROUGH THE NET

It is an insect, on the other hand, that gives us honey. As I came by my garden this morning, I stopped a moment before my beehives. What excitement of work was there! On *one* hive is now sixty-four pounds of beautiful honey, all sealed up for me in one-pound boxes ready for pancakes next winter! This is not all that that colony will give me either, for on the first of August they will go crazy with joy over the sweet pepper bush and get me from that bush thirty-two pounds more of the whitest, rarest sweet ever tasted — and that before the goldenrod comes on from which they will gather "golden drips" honey — ten or possibly thirty pounds more.

All of that is the work of insects, of the children of just *one* little insect — the old queen bee in that hive, whose right wing I have clipped to keep her safely at home.

INSECTS ARE INTERESTING

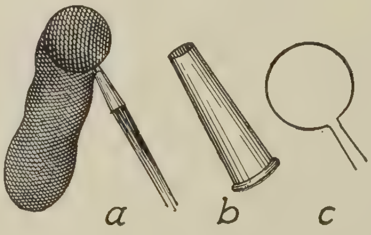
When one old queen bee insect can do all of this, anyone will admit that insects are important. Now a hive of bees is also interesting. *Interesting* is not the word. Why, once you get to keeping bees you would rather watch them and work with them than play golf or go to the circus or do anything else I know.

Just so it is with a colony of ants, or a nest of yellow jackets, or the amazing life of a seventeen-year locust. Then the beauty in the moths and butterflies — if one stopped with that, it would be quite enough to lead one to get a net and go after them.

Courtesy of Dadant & Sons

BEES AT WORK ON A COMB

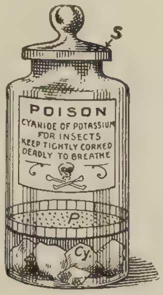
In order to capture, prepare, and preserve your insect specimens, you need some tools and suggestions which I am giving you on this page by illustration — a simple, clear method, which I am quite sure can hardly be misunderstood.



a, NET. *b*, FERULE OF NET. *c*, WIRE FRAME

IN THE FIELD

In the field you will need some strips of newspaper in which the butterflies may be folded without injury to legs and wings and carried home. A little bottle of chloroform may be carried too, a drop from which on each side (insects breathe through their sides) will kill them, if you do not wish to drop the delicate-winged creatures into the cyanide bottle with the hard-legged beetles, which may spoil your specimen.



CYANIDE BOTTLE

But don't try to do too many things at one time. This summer start in with beetles, or butterflies, or moths, and come to know those in your neighborhood thoroughly. You can easily speed over too much ground and really do nothing worth while.

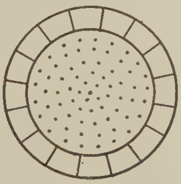


DIAGRAM OF PAPER TO BE CUT, FOLDED, AND PERFORATED, FOR PLACING IN CYANIDE BOTTLE

Your net, then, your cyanide bottle (or chloroform), your strips of paper or envelopes, a few flat boxes, pencil, and notebook — and you are equipped for field work.

HOW TO MOUNT YOUR SPECIMENS

You can buy plaster-of-paris blocks with glass covers and depressions in the plaster to hold the body of the insect. But these show only one side of the creature, and besides they are expensive. Or you can use drawers or flat boxes, described on page 380; or you may make out of pieces of scrap glass little glass boxes with wooden sides cut from strawberry baskets, and glued together with glue or passe-partout paper used for mounting photographs.

Spread your insect as shown on page 382; let it dry, then with a touch of glue fasten it to the bottom of the little rectangular box you have made. If it is a beetle, glue a post, made of a match stem, to the glass, so as to lift the beetle up as if it were walking, and stick it on to this post; put on the glass cover, fasten it with the gummed paper (black), and there is your insect showing both sides if you pick it up. Besides, you can glue its eggs, its mounted caterpillar skin, its pupa case, its molted skins, the leaves it has eaten, etc., in the little box with it and thus have a whole life story to be read at a glance.

Skins of caterpillars can be mounted by making a small opening near the tail, then with a match stem pressing out the contents of the skin carefully. With a small glass blowpipe fill the skin with air, dry over a slow lamp, and mount with glue.

HOW TO PRESERVE THE SPECIMENS

"The secret of preserving collections of butterflies in beautiful condition," says W. J. Holland,[1] "is to exclude light, moisture, and insect pests. Light bleaches many species, moisture leads to mold and mildew, and insect pests devour the specimens. The main thing is, therefore, to have the receptacles in which the specimens are placed dark and as nearly as possible hermetically sealed and kept in a dry place. In order to accomplish this, various devices have been resorted to.

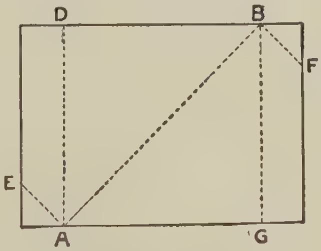


DIAGRAM OF PAPER ENVELOPE FOR HOLDING BUTTERFLIES

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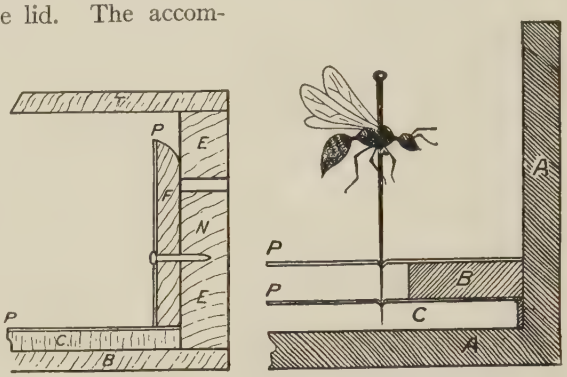
[1] "The Butterfly Book." By permission of Doubleday, Page & Co.

"*Boxes.* Boxes for the preservation of specimens are made with a tongue on the edges of the bottom fitting into a groove upon the lid, or they may be made with inside pieces fastened around the inner edge of the bottom and projecting so as to catch the lid. The accompanying outline shows one method of joining the parts of a specimen box. The bottom of the box should be lined with some substance which will enable the specimens to be pinned into it securely. For this purpose sheet cork about a quarter of an inch thick is to be preferred to all other substances. Boxes should be made of light, thoroughly seasoned wood, and should be very tight. They are sometimes made so that specimens may be pinned both upon the top and the bottom, but this is not to be commended. The depth of the box should be sufficient to admit of employing the longest insect pin in use, and a depth between top and bottom of two and a quarter inches is therefore sufficient.



DETAIL OF CONSTRUCTION OF BOXES, AND METHOD OF PINNING

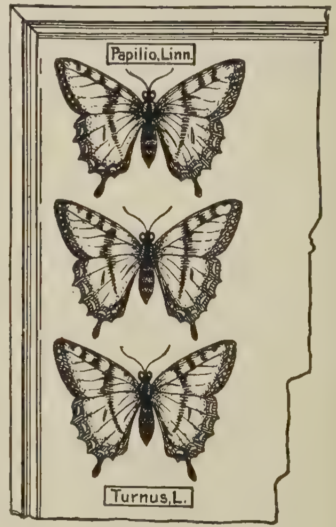
Boxes are sometimes constructed with backs in imitation of books, and a collection arranged in such boxes presents an attractive external appearance. A very good box is made for the United States Department of Agriculture and for the Carnegie Museum in Pittsburgh. This box is thirteen inches long, nine inches wide, and three inches thick (external measurement). The depth between the bottom and the lid on the inside is two and one eighth inches. The ends and sides are dovetailed; the top and bottom are each made of two pieces of light stuff, about one eighth of an inch thick, glued together in such a way that the grain of the two pieces crosses at right angles, and all cracking and warping are thus prevented.

The lids of these boxes are secured to the bottoms by brass hooks fitting into eyelets. Such boxes provided with cork do not cost more than fifty-five cents apiece when bought in quantities.

HOW TO ARRANGE AND LABEL

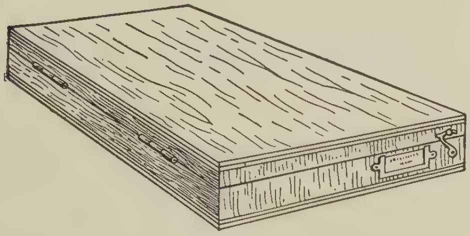
"The beginner who has not a long purse will do well to preserve his collections in boxes such as have been described. They can be obtained quite cheaply and are most excellent. Cabinets are more or less of a luxury for the amateur, and are only a necessity in the case of great collections which are constantly being consulted. The boxes may be arranged upon shelves. Some of the largest and best collections in the world are preserved in boxes, notably those of the United States National Museum.

"*Labeling.* Each specimen should have on the pin below the specimen a small label giving the date of capture, if known, and the locality. Below this should be a label of larger size, giving its scientific name, if ascertained, and the sex. Labels should be neat and uniform in size. A good size for labels for large species is about one inch long and five eighths of an inch wide. The labels should be written in a fine but legible hand. Smaller labels may be used for smaller species. A crowquill pen and India ink will be found best suited for the purpose of writing labels.


Papilio.Linn.
Turnus,L.

ARRANGEMENT OF SPECIMENS IN CASE

"*Arrangement of Specimens.* Specimens are best arranged in rows. The males should be pinned in first in the series, after them the females. Varieties should follow the species. After these should be placed any aberrations or monstrosities which the collector may possess. The name of the genus should precede all the species contained in the collection, and after each species the specific name should be placed. The lower illustration on page 380 shows the manner of arrangement.



SPECIMEN BOX

Showing space for labeling and hook to keep box tightly closed.

HOW TO KILL THE PESTS

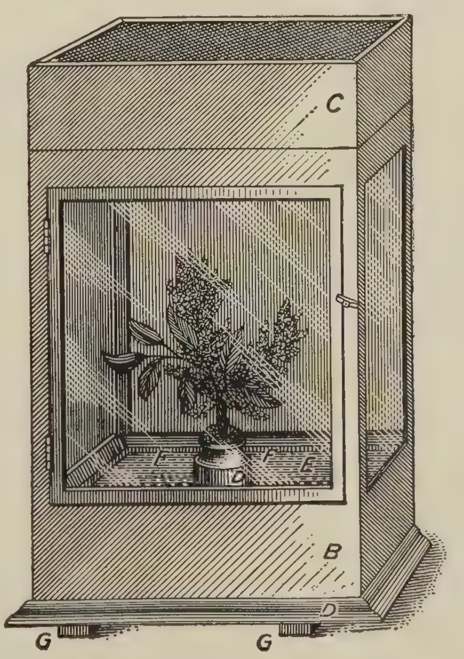
"*Insect Pests.* In order to preserve collections, great care must be taken to exclude the various forms of insect pests, which are likely, unless destroyed and kept from attacking the specimens, to ruin them utterly in a comparatively short time. Beetles, moths, and mites prey upon the collections.

"In order to prevent the ravages of insects, all specimens, before putting them away into the boxes or drawers of the cabinet in which they are to be preserved, should be placed in a tight box in which chloroform or, better, carbon bisulphide (a very explosive material, to be kept away from fire) in a small pan is put, and they should be left here for at least twenty-four hours, until it is certain that all life is extinct. Then they should be transferred to the tight boxes or drawers in which they are to be kept. The presence of insect pests in a collection is generally first indicated by fine dust under the specimen, this dust being the excrement of the larva which is committing depredations upon the specimen. In case the presence of the larva is detected, a liberal dose of chloroform should at once be administered to the box or tray in which the specimen is contained. The specimen itself ought to be removed, and may be dipped into benzine. Naphthaline crystals or camphor is generally employed to keep out insect pests from boxes. They are very useful to deter the entrance of pests, but when they have been once introduced into a collection neither naphthaline nor camphor will kill them. Naphthaline is prepared in the form of cones attached to a pin, and these cones may be placed in one corner of the box. However, a good substitute for the cones may very easily be made by taking the ordinary moth balls, which are sold everywhere. By heating a pin red-hot in the flame of an alcohol lamp, it may be thrust into the moth ball; as it enters it melts the naphthaline, which immediately afterward cools and sets hard about the pin.

NAPHTHALINE CONE

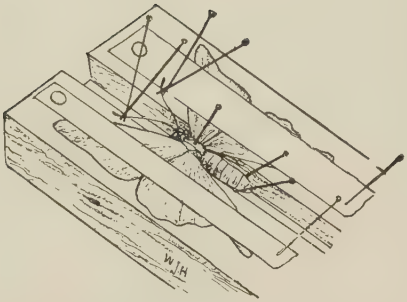
HOW TO FIND CATERPILLARS FOR YOUR CAGE

"Long before you learn the favorite foods of your caterpillars and where to look for them,



INSECT CAGE

Some very interesting observations can be made with a cage of this sort.



BUTTERFLY PINNED ON BOARD

Showing method of holding up body and pinning down antennæ.

you will find it a great help to watch for signs of their presence. Eaten leaves on bushes and trees are evidences of their work, but generally underneath the trees will be found the frass or ejectamenta of the caterpillar. The presence of the ejectamenta and the evidence of the ravages committed by the larvæ upon the foliage will give the collector a clew to the whereabouts of the caterpillar. Try searching for caterpillars that feed upon the trees along the wide, sandy margins of brooks, creeks, and rivers. The frass is easily discovered upon the sand, and by casting the eye upward into the foliage it is often easy to detect the insect. The pavements in towns and cities which are bordered by trees may also very well be scanned for evidence of the presence of caterpillars."[1]

BE YOUR OWN "SUGGESTIONS"

But these suggestions are only suggestions and by no means a complete guide. You do not need a complete guide; if you did, then you should wear blinders, have a bit put into your mouth, with someone to pull this way and that and say "gee!" "haw!" and "whoa!" Be your own suggestions. Make your own apparatus; arrange your own collection; have your own purpose in doing it; give distinction to your work by putting yourself in it.

A FEW GOOD BOOKS ON INSECTS

The Butterfly Book, by W. J. Holland
Insect Life, by J. H. Comstock
Cities of Wax, by Julie Closson Kenly
The American Boys' Book of Bugs, Butterflies and Beetles, by Dan Beard
The Children's Life of the Bee, by Maurice Maeterlinck
Holiday Pond, by Edith M. Patch
Handbook for the Curious, by Paul Griswold Howes
Spiders and Scorpions and *Some Curious Insects*, by F. M. Duncan
Book of Insects (illus. by Detmold) and *Insect Adventures*, by G. H. Fabre
Seeing the Unseen, by Robert Disraeli
Our Insect Friends and Foes, by Belle S. Cragin
The Insect Book, by L. O. Howard
Do You Know? by Janet Smalley
Leaves and Grasses, by Dorothy Waugh

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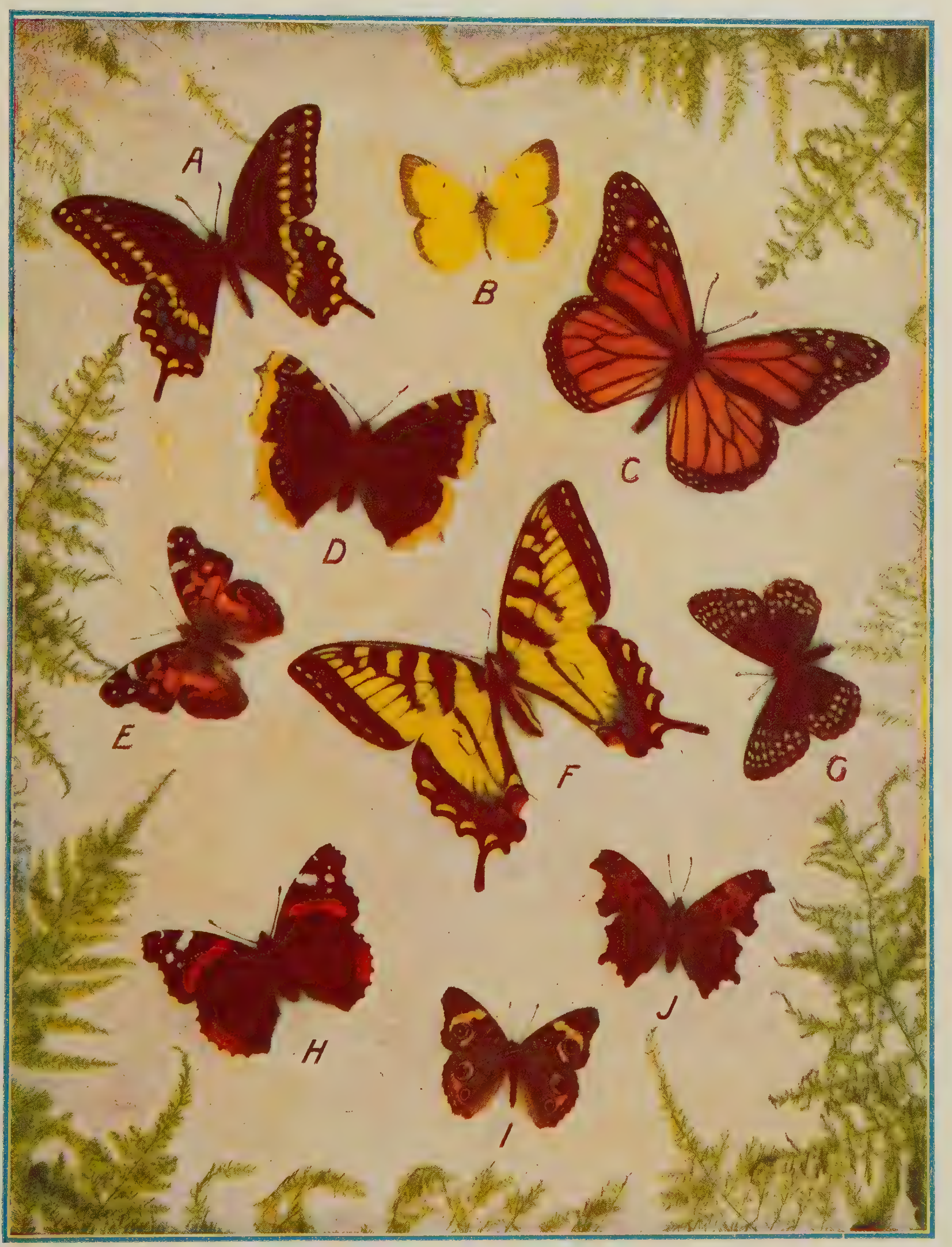
[1] "The Butterfly Book."



AMERICAN BUTTERFLIES

A. Black Swallowtail (*Papilio polyxenes*).
B. Common Sulphur (*Colias philodice*).
C. Monarch (*Anosia plexippus*).
D. Mourning Cloak (*Vanessa antiopa*).
E. Hunter's Butterfly (*Pyrameis huntera*).
F. Tiger Swallowtail (*Papilio turnus*).
G. Baltimore (*Melitaea phaeton*).
H. Red Admiral (*Pyrameis atalanta*).
I. Buckeye (*Junonia coenia*).
J. Comma (*Grapta comma*).

MAKING AN HERBARIUM

(*By Edmund W. Sinnott*)

THE best and most pleasant way to become well acquainted with plants is to gather a collection of pressed and labeled specimens, or an herbarium, as it is called. Such a collection, however, should be made with some care and in obedience to a few accepted rules if it is to be of greatest service to its owner and of real scientific value.

WHAT TO COLLECT, AND HOW TO KEEP MATERIAL FRESH

Discretion must first be used in deciding what is to be collected. Specimens illustrating as many different parts of the plant and stages of its development as possible should be taken; but, since most of the features used in classifying plants are found in the flowers, it is of course very important to get specimens which are flowering fully. Almost always such pieces will illustrate the character of the stem and mature leaves also. Some plants, however (mostly trees), develop their flowers before the leaves are fully grown, and in such cases it is well to collect a flowering twig early in the season, and another later to show the mature leaves. It is often important to have material illustrating the ripe fruit also. Only twigs and small branches of woody plants are ordinarily collected, but with herbs the whole plant, root and all, should be pulled up and pressed. All material selected ought to be as free as possible from injuries and defects and to be a typical representative of its species.

To prevent specimens from wilting, a tin collecting box, which may be tightly closed, is most useful. A receptacle made especially for this work is known as a "vasculum." When this is not to be had, a convenient method of keeping material fresh is to wet each specimen thoroughly in clean water and then to wrap it in damp newspaper. A bundle of these packages may be wrapped up in waxed or oiled paper and kept from drying until ready to press. All soil before this should have been washed thoroughly from the root system.

PRESSING AND DRYING

To press and dry plants successfully requires some little skill. If the specimen is too long it may be folded back or broken so that it all can be placed on an ordinary herbarium sheet. Very thick parts, such as bulbs, rootstocks, or big heads of flowers may be trimmed off at the back to enter the press more readily, but it is always better to have everything in its natural condition if possible. Bulky fruits should be removed, labeled, and placed in boxes. When the specimen is ready to press it is first placed on a thin paper folder. One thickness of ordinary newspaper is as good as anything. Care should be taken to have the parts well arranged, the leaves spread out flat (some showing the upper and some the lower surface), and all the important things easily visible. All facts that are to be recorded about the plant, such as the date and place of collecting, with the kind of habitat (dry sand, peat bog, salt marsh, etc.), should either be written on this folder or on a label or slip of paper to be placed inside. If such a record is not kept with the material from the start it is apt to be lost or forgotten and the value of the specimen greatly reduced.

Ordinary blotting-paper may be used for drying, but regulation felt driers, purchased from any botanical supply company, are more satisfactory. The usual method of pressing consists in making a pile of alternating blotters and specimen-filled covers and then in placing a weighted board on top or strapping up the whole pile tightly between boards or stout covers. Several blotters between each folder are often better than one. The damp blotters should be replaced by thoroughly dried ones every day (better twice the first day) until the specimens are perfectly dry. Very rapid drying is often necessary if flower colors are to be well preserved, and this may be accomplished by heating the blotters just before they are put in, and by changing them frequently.

A simpler method of drying is by the use of heavy paper, corrugated on one side, and cut into pieces the size of the blotters. With these, a pile should be built up as follows: corrugated paper, blotter, specimen, blotter, etc. The pile should be strapped up tightly, by straps at each end, between boards, or, better, latticed frames, and hung up in the sun or in a dry room. The blotters need not be changed, for they are dried by the air circulating through the spaces between the corrugations. With either method, it is always well to examine the specimens after a day's pressing to straighten out folded leaves and petals and to arrange parts in their permanent position.

MOUNTING

The dry specimen should finally be mounted on heavy white paper of the regulation size of eleven and one-half by sixteen and one-half inches. It may be attached either by numerous strips of surgeon's plaster or by gluing the whole specimen to the sheet. The glue may be applied easily by laying the plant on a glue-covered glass. Some parts, such as spruce needles or buttercup fruits, are apt to rattle off easily when dry, but samples of these may be placed in pockets pasted to a corner of the sheet. The label, with the collector's name and all facts recorded about the specimen, should be placed in the lower right-hand corner. The finished herbarium sheets may now be filed away, by species, genera, and families, each group being in a folder of stout paper.

Identification may be accomplished with the aid of any good book on the subject. Fresh material is usually easier to work with, but a well-made herbarium specimen is almost as good. It also has the great advantage of being a permanent and easily accessible record.

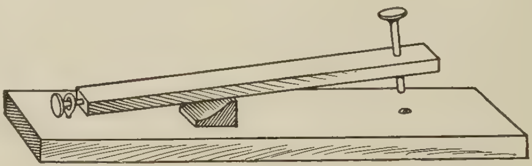
Plants are known by "common" names, the familiar ones like "buttercup" and "daisy," and by Latin names the system for which was made by the naturalist Linnæus. He divided the whole vegetable kingdom into "families" and each family into "genera," smaller groups. Each genus was divided, in turn, into "species." Latin was at that time the universal language of scholars. It holds to-day the position of being a common name-language for botanists who, since the days of Linnæus, have adopted his system for naming and describing their plants. If you label your specimens by this system, a French or German or Italian botanist could recognize your plants with no barrier of an unfamiliar language to overcome.

HOW I MADE MY FIRST MICROSCOPE

By Charles L. Bristol

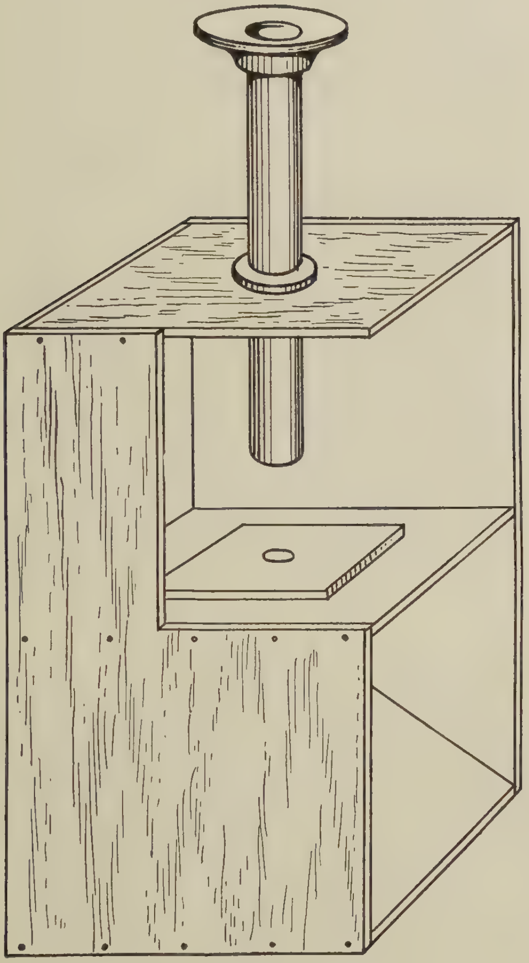
WHEN I was a lad of twelve I had a look through a microscope and saw some of the interesting sights of that wonderful instrument. I was filled with the desire to see more of them and searched around for the means of doing so. I could not buy a microscope, and the case seemed hopeless. But I read in a book that the lenses of the tube at the eye end of a spyglass, or terrestrial telescope, formed a microscope of low magnifying power which enlarged the image formed by the large lens — the objective — at the other end. I had a spyglass and at once I took the lens out of the spyglass and tried it on the hairs on the back of my hand. To my delight I found that the book was right and that I had a microscope.

I could not hold it steady enough, however, to enable me to see plainly the fine details of an object, and I set about to devise a holder.



THE HOLDER, FIG. 1

My first attempt was made as follows: I took a piece of planed pine board two inches wide, an inch thick, and about a foot long. I bored through this, near the end and at right angles to the surface, a hole a very little larger than the brass tube of the eyepiece. I wrapped a strip of paper around the tube until it fitted snugly into the hole. Then I drove a nail in the other end of the board near the middle, leaving about an inch sticking out. I took another piece of board five or six inches wide and about eighteen inches long for a base. I screwed a screw-eye into the surface near the middle line and four or five inches from the end, so that the nail in the first piece would go through it. When the nail was put through the screw-eye it held that end of the holder fast, but allowed it to move up and down. I made a wedge-shaped piece to put under the holder, and by moving it backward and forward I could focus the eyepiece up and down until the object, which I laid under the end of the tube, showed sharply all of the fine details. When ready, the instrument looked like Fig. 1.



CIGAR BOX MICROSCOPE, FIG. 2

This proved to be a very good instrument for seeing opaque objects. It focused readily and I could put almost any-sized thing on the board. But it was not good for transparent objects, and when spring came, and brought with it a whole host of interesting living things which were more or less transparent, I wanted something better.

By chance, apparently (though, as a matter of fact, such things come because the boy or girl is looking for just such things and sees them) I came across a drawing which showed the principles of the construction of the microscope, and I gained a clear idea of what was needed. I made a good many attempts to accomplish my object before I succeeded, but that was good training, and every boy and man likes to do something new to him. I had a perfectly clear idea of what was wanted, and my task was to fix up something that would accomplish that result. More than half of the job lay in my knowing what I wanted to do.

Finally I succeeded in making a practical instrument in the way described below; and if you will study Fig. 2, you can, with a little help, make one for yourself, if you are lucky enough to have a spyglass. You will not injure the eyepiece, and you can put it back into the spyglass whenever you want to.

I procured two deep cigar boxes of the same size and carefully took out of one an end piece for the stage. I unscrewed the tube from the spyglass, leaving on it the screws and slide which fits on to the second joint. I made a hole in the exact center of one end of the box, and fitted it carefully with sandpaper wound around a round stick so that the screw of the sliding piece would screw into it fairly tight and square. This allowed me to focus easily and accurately.

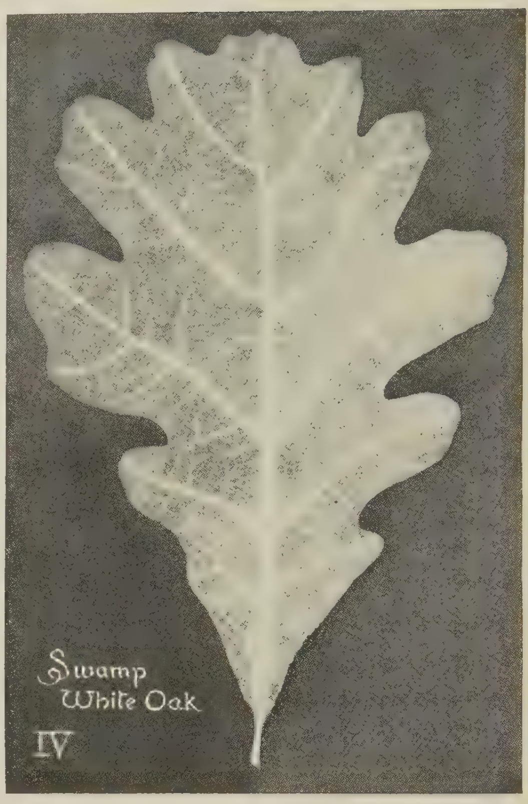
I bored a half-inch hole in the center of the end piece which I took out of the other box, and then nailed the piece into the box about one inch lower than the lower end of the tube when it is pushed halfway down through the slide. This formed the support or stage for a piece of clear glass upon which I laid transparent objects so that the light shone through them and then through the microscope. In order to reflect the light to the object I fitted a piece of shiny white cardboard below the stage at an angle of forty-five degrees, and when the open side of the box was turned toward the light the object was illuminated and I could see the internal parts of many small plants and animals.

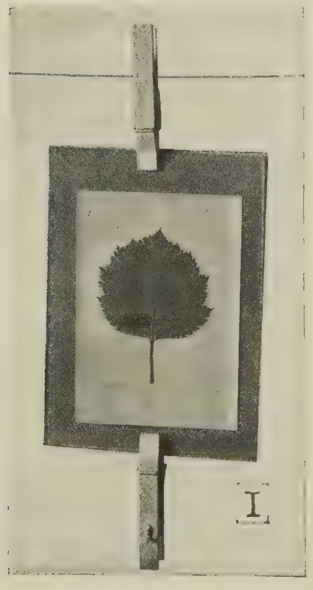
Later, for convenience, I cut out a little more than half of the right side of the box above the stage so that I could reach the object and move it around more easily.

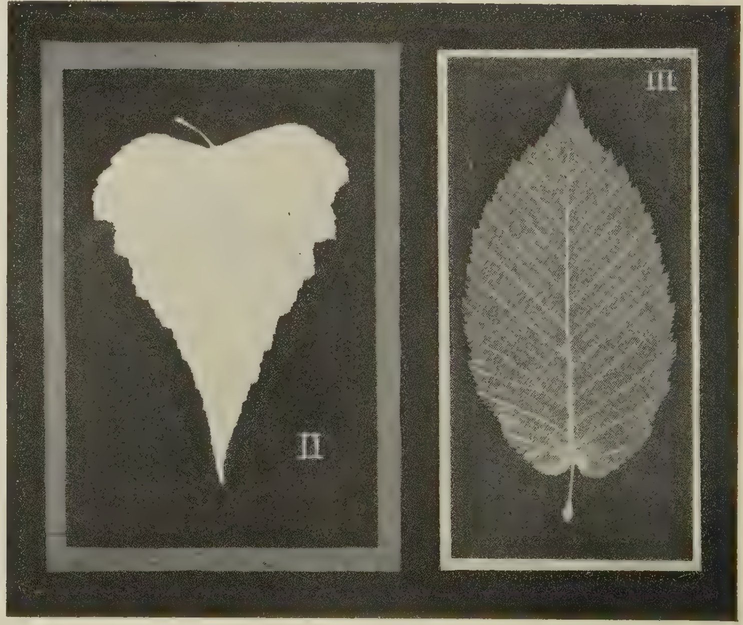
LEAF PRINTS

ALONG with your herbarium, you may be interested to make a collection of leaf prints, prints on photographic paper made from the leaves themselves without a camera.

Buy some blueprint paper, or some Van Dyke paper, say 4 × 5 in size; get a piece of window glass and a piece of stiff cardboard, and two spring clothespins, as shown in Fig. 1. On your card put a piece of printing paper; on that a leaf; over that the glass; hold all together by means of the two clothespins. If you work very quickly, all this may be done in a room where direct sunlight does not fall. The best results will be secured if the adjustment is made in a closet or darkened room, lighted, if at all, only by a red light. Expose the paper to direct sunlight for a few minutes, and then develop it in running water. The print should now be placed in a solution of the fixing salt (which the manufacturers sell with the paper), and then washed again, for fifteen minutes. The prints, when dry, may be mounted on cards. Figs. 2, 3, and 4 show well-mounted prints made from leaves direct, as described. Not only leaves, but sprays, grasses, sedges, ferns that can be pressed pretty nearly flat may be printed from in this way.







Nature Study Notes

(IN SUMMARY)

By

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Care of Young

Sea Otter	A STRONG swimmer found along the shores of the North Pacific Ocean. His body is about three feet long and nineteen inches high. It is shiny brown in color, with gray mouth and shoulders. One cub is born, which the mother will bravely defend. She teaches it to swim, carries it in her mouth, and holds it between her front paws when sleeping. The sea otter eats fish and shellfish. His enemies are sea bears, sea lions, and man. Man hunts him for his valuable fur. *Page 214; I, 252*
Gopher	FOUND in the Old and New Worlds. He eats grasses, berries, roots, and small animals. He hunts his food at night. He often kills trees by gnawing the bark. Four to eight young are born in a litter. The parents take good care of them, and make their homes in deep holes in dry soil. The fur is brownish or gray above and lighter below. The gopher hibernates in winter. He has a short life. *Pages 163, 166*
Sea Horse	A STRANGE animal living in the shallow waters of warm seas, feeding on small shellfish. The female lays the eggs in a pocket on the under side of the tail of the male. Several females may lay their eggs in the same pocket. The male sea horse carries these eggs about until they have hatched into young ones, then he presses them out. The sea horse's body is colored like the things he lives near. This helps protect him from his enemies. *I, 209; X, 114, 275*
Gray or Giant Kangaroo	LIVES in the plains of Australia. He may grow to be six feet in length. His short front legs, strong back legs, and tail help him in jumping. The kangaroo is a marsupial. Marsupial mothers carry their young around in a pocket after they are born. Sometimes, when frightened, the kangaroo will return to his mother's pouch months after he is large enough to look after himself. He feeds on grass and roots. His long teeth help him to find food where sheep would starve. He lives with other kangaroos in small herds. His skin is tough, and is sometimes used for leather. *X, 118, 119, 275, 276*
Ichneumon Fly	OFTEN gives her life that reproduction may take place. With her egg layer she bores into the wood of trees for an inch or so, hunting the Tremex larva. When this is found, she lays the egg. When the larva, or baby Ichneumon, hatches, it sucks the blood of the Tremex larva. Sometimes the mother cannot draw out her egg layer, and is found dead, clinging to the tree. The mother Ichneumon may not live to see her young. But she has cared for them by laying the eggs where there is plenty of food. *Page 138*

Social and Community Life

Prairie Dog	LIVES in the plains of North America. He is a true marmot. He eats grasses and grains. Four young are born and are well taken care of in the holes which each pair builds separately for their own. About twelve are found in a hole. Prairie dogs are sociable animals, building their homes in villages. When the villages become too full, the older ones migrate. They hibernate, carefully closing with dirt and grasses the entrances to their holes. The color is sandy red, lighter on cheeks and under-body. *Pages 165, 166*
Timber Wolf	FOUND throughout North America. He has a white face, silver flanks, and a brownish back. He is larger and heavier than the common wolf. These animals feed on anything from a mouse to a moose, hunting in pairs. In winter, when food is scarce, they hunt in packs and will even attack man. They howl to collect the pack. The length of life is about ten years. Four to eight young are born. They will breed with the dog. The timber wolf is destructive, and in some places money is paid for killing him. *Pages 225, 227*
Ants	HERE is an almost perfect community life. Everything is done for the good of the group. Even the bees do not seem to reach this stage. There are the drones (males), the workers, and the queens. The queens are the mothers of the colony. After the wedding journey of males and females, the females tear out their wings and lay the eggs. After a short time the males die. The eggs pass through the larva and the pupa stages to the adult stage. Ants feed on animal food, sweet substances, and keep plant lice or " cows." *Page 136 ; X, 281-283*
Brown Pelican	A FISH-EATING bird of warm seas. Beneath the lower bill is a large fold forming a pouch for food storage. He dives for food from a height of twenty feet, the sides of the bill bent outward, making a good fish-net. Pelicans nest in groups on islands. The nests are built on the ground or in bushes. Three large white eggs are laid. The old birds are silent, but the young are noisy. As many as three young birds will stick their heads in the bill-pouch, searching for food. *I, 257, 258 ; X, 168, 297*
Madrepore Coral	LIVES in warm ocean waters, liking best of all the Indian and Pacific oceans at a depth of thirty feet. Greatest builder in the world, taking ocean salts and building them up into the hard shell of lime which, when grouped by thousands, form islands. The coral is a soft-bodied animal with feelers about the mouth and a shell. The shell has beautiful colors and may be very hard. The groups arise from budding and division of the little animals. Besides having value as island builders the shells are used as jewelry. *I, 222 ; X, 232, 233*

Number of Babies and Care the Parents Give Them

Codfish	A VALUABLE fish living in the North Atlantic, but also found wandering about in the Arctic. Several millions of eggs are laid by a single fish, near shore. No care whatever is taken of the eggs. The cod is from nine inches to six feet long and weighs from ten to thirty-five pounds. His silvery body is much speckled and has a white line along the side. He eats Irish moss, whelks, young salmon, crabs, and starfish. The codfish is used as food, and also for cod-liver oil; the dried swim bladder is used for isinglass. *X, 9*
Lion	ROAMS the plains and low woods of South and Central Africa. He is reddish yellow or brown. Usually two cubs are born each year. Although the cubs are born with their eyes open, they remain in the lair with the mother for two months. They need much teaching in how to hunt and kill the animals that provide their food, and sometimes they follow the mother for a year. The lion eats antelopes, zebras, and dead animals. Lions live for about fifteen years. *Pages 209-211*
Five-Fingered Starfish	THE reddish kind is found on both sides of the Atlantic. The five arms have on the underside hundreds of little tube-feet, with which the starfish moves about and opens the shells of mussels, clams, and oysters. The mouth is in the center of the under side. The female lays thousands of eggs which are fertilized by the male. The young mature in a year and shift for themselves, going to the open sea and coming toward shore when older. The larvae do not have arms, as the adults do. *I, 226-228*
American Robin	THE first bird of spring in the northern parts of the United States. The robin migrates north of Virginia to lay eggs. The nest, built in the fork of trees, holds three to five greenish blue eggs. Two or three sets of eggs a season are laid. The young are helpless even after they have left the nest, and are carefully fed by both male and female parents. Young robins would starve even if food were piled beside them. Robins eat insects, but if these fail, they can eat fruits, nuts, and grain. *Page 308*
Crocodile	A REPTILE found in the waters of Africa, Central America, the West Indies, India, and Australia. The crocodile gives some care to the twenty to thirty eggs until hatching and for a little time afterwards. The eggs, the size of goose eggs, are buried in sand. They hatch in twelve weeks, the young making a hiccough-like sound, telling the mother to clear away the sand. The skin is tough, with scales, and wrinkled. The crocodile is the largest living reptile. He is flesh-eating, and likes young antelopes. They are long-lived; crocodiles forty years old are not uncommon. *Page 274. See also Volume X*

*Cold-Blooded and Warm-Blooded Animals**

Rainbow Trout	THOUGH having come from the Pacific Coast, this fish now lives all through the East. He is found in fairly deep water. The eggs, large and loose, are laid in the head waters of streams, in April and May. As many as 2500 eggs may be produced, hatching in fifty days. The young are not cared for. Trout are watchful and hard to catch. Some have been known to live for fifty years. They eat fresh-water snails, dragonflies, insects, minnows, and small animal life. Trout, like all fish, are cold-blooded. *Pages 255, 262-264*
Mexican Axolotl	AN amphibian found from New York to California and south to Central Mexico. He may spend his entire life in water, breathing by gills; or he may go on land, change his form, lose his gills, and develop lungs. At one time he was thought to be two different animals. The male is about six inches long, the female nine inches. The color is brownish or bluish black, silvery beneath and splotched with yellow. The axolotl is mostly a meat eater. All amphibians are cold-blooded. *Pages 238, 239*
Ruby-Throated Humming Bird	FOUND in Eastern North America. Warm-blooded and quick-moving, needing lots of food for the energy of heat and motion. He is about three and one half inches long. The male's throat is ruby red, the female's is gray. The nest is beautiful. It contains two white eggs. The young hatch naked and remain in the nest for three weeks. The note is a sharp squeak or excited chippering. Humming birds eat nectar and small insects. The bill is shaped for entering the petal cup of the flower. *Pages 320-321*
Rattlesnake	FOUND in almost all parts of the United States. He is known by the row of thin buttons at the end of the tail which he rattles before striking. The rattles are pieces of cast-off skin. (Each one does not mean a year of the rattlesnake's age, as is commonly supposed.) He is usually about five feet long. His food consists mostly of mammals hunted at night and eaten whole. Pairing takes place in the spring, and the young hatch from eggs. All snakes are cold-blooded animals. *Pages 283-287*
Gorilla	FOUND in the jungles of West and Central Africa. He is the largest of the man-like apes. He stands five feet, six inches high. The body is covered with thick black hair, but the face, ears, and chest are hairless. Like all other mammals, he is warm-blooded. The females and young go up trees at night while the male sleeps at the base. He fears no jungle animal. He eats vegetables, grains, and fruits. There is one young at each birth. The gorilla always shuffles along on all fours except when attacked by man. *Page 234*

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* See also Volume X, 356, 357.

Ways of Protection

Chameleon	A LAND lizard suited for life in the trees. Strange kinds are found in Africa. He eats small insects caught by the long tongue quickly shot from the mouth. The eggs are usually laid in the ground, but in some forms the young are hatched within the body of the mother. The chameleon changes color when there are changes in heat and light, and when he is afraid or angry. This helps the chameleon to escape his enemies, because he can make himself look like either the bark or the leaves of the tree. *Pages 279, 282; X, 136*
Rabbit	RABBITS and hares are found throughout the world wherever the climate is not too cold. They eat grasses, vegetables, corn, and the bark and shoots of trees. The rabbit is protected in a number of ways. He can kick and bite. He can escape from his enemies by running and dodging at full speed. He frequently escapes because his color is like that of his surroundings. Rabbits living in the Far North are white during winter. Rabbits can multiply very rapidly. *Pages 156-158*
Canadian Porcupine	FOUND from the tree limit of North America to Mexico. His food consists of twigs, leaves, and bark. One or two young are produced at each birth, and are well taken care of in the holes in the ground which are their homes. Porcupines guard their young well, by screening them. They are night-loving animals. Their odor is one form of protection, their quills another. When attacked, a porcupine tries to stab his enemy with the quills by moving quickly forward or backward. *Page 159; X, 174*
Skunk	FOUND from Canada to South America. He lives on small animals, such as mice and insects. Skunks live in holes in the ground, hollow logs or crevice in rocks. The babies are born each year in May and June, and are carefully guarded. The fur is black with streaks of white on the crown and tail. When attacked, the skunk protects himself by giving off a disagreeable fluid which can be thrown from ten to fifteen feet. He protects himself also by hunting for his food at night. *Pages 52, 215-217*
Walking Stick	LIVES in the tropics; but there is one wingless form in the Northern States. He protects himself in an interesting way — by hiding himself. The body is long and pointed, and colored like the twigs upon which it rests. The wings may fold close to the body, or may be veined like the leaves upon which he lives, or may be absent. The legs are long and twig-like. He eats leaves. The large eggs are dropped to the ground from the tree and left there by the mother. *Pages 130, 131*

How Parts of Animals Are Built for Different Uses

Greenland Right Whale	FOUND in Polar regions. He is about fifty feet long, and black in color. He eats little sea animals. After these are taken into the mouth, they are kept from leaving with the water by means of strainers. These strainers are strips of whalebone ten feet long, which take the place of teeth. The whale migrates to warmer waters to reproduce, and the young are cared for by the mother for two years. Whale oil and whale bone are valuable. *Pages 178, 179*
Camel	THE dromedary of North Africa is the riding camel of one hump. The two-humped camel of Central Asia is used for carrying loads as heavy as 1200 pounds. He eats shrubs, thorns, and coarse grass. Breeding takes place every two years. One young is born, and the calf is weaned in a year. The color tones are brownish. Nature has fitted the camel for long desert trips by giving him the hump, used for storing food, and an extra stomach, used for storing water. *Pages 202-204; X, 263*
Flying Squirrel	LIVES in the Himalayas and north East India. He has a skin stretching from elbow to knee and then to tail by means of which he glides from higher to lower branches of trees. The glide may be sixty or seventy yards long. He lives to be about two years old. Three or four young are born in a nest made near the end of a branch. He eats fruits, nuts, bulbs, and shoots of trees, but often turns to meat eating in the spring. The squirrel is active during the day. *Pages 174-176; X, 46, 79*
Wood-pecker	FOUND throughout the United States. He eats insects, worms, grubs, and sap. The bill, tongue, and toes are fitted for getting food. The bill is long, straight, and hard, used like a chisel. The toes are in twos and opposite each other, so as to cling well. The tail is used also for a prop or third leg. The tongue is fitted for quick back-and-forth motion. Nests are built inside decayed trees. Five to seven white eggs are laid, and the young are well taken care of. *Page 34; X, 167, 168*
Elephant	THE largest land mammal. Is found in India and Africa, and is related to the Mammoth, a prehistoric animal of the Frozen North. They go in herds under the rule of a bull. They defend themselves with their tusks. The trunk is a drawn-out upper lip and nose. It is used to carry food and water to the mouth; to dust the body; to help to clear the path; and to punish the young. The elephant is fully grown at twenty years of age. *Pages 204, 205; X, 117, 165, 166, 286*

Hibernation of Animals

Turtle	NOT all turtles live in fresh water; some live in the sea, and some are true land tortoises. They are a kind of reptile, but the backbone and ribs are formed into a hard case on the outside of the body. The young are hatched from eggs laid in sun-warmed sand. They are active, and breathe by lungs throughout their whole life. Some turtles hibernate during the cold months under stones and in mud. Certain kinds are used for food. There are turtles which weigh as much as 1600 pounds. *Pages 18, 266-270; I, 245-246*
American Badger	FOUND over the north temperate regions. He is a night-loving, burrowing animal, careful and intelligent enough to spring traps. The American badger hibernates from October to April, changing color with the seasons. During the winter season badgers have a white or gray streak through the length of the back. The rest of the coat is dark or gray. The length of life is about six years. Three or four young are born in the burrow, which is always kept very clean. The badger eats small animals, insects, and dead meat. *Page 217*
House Fly	THIS insect came from Europe. It lives on decaying manure, meat, and garbage. The eggs are laid in some such substance, and soon small, white, legless worms or maggots hatch. These feed heavily and then form a barrel-shaped pupa from which, in one week, the winged adult comes. The adults may carry disease by walking over filth and then over food. There is a sticky substance on the feet which helps the fly to walk upside-down. Most flies die at the cold of the autumn, but some hibernate through the winter.
Dormouse	COMMON in Europe. A small animal, about three inches long and two and one half inches high, with brownish body. He hibernates for nearly six months in a year in a snug little nest, lined with grass and hair, in the fork of a tree. When hibernating he rolls into a ball. The dormouse eats grains, seeds, fruits, eggs, caterpillars, and bees. About four blind young are born at a time, and there may be several sets of young each year. He is tameable, but does not live long when captured.
Common Bat	FOUND throughout the world except in arctic regions. He is the night police of our gardens. The bat is a mammal with a long front arm and a skin stretched over the hand. He is about two and one half inches long, and has a wing-spread of eight inches. The vampire bat of South America has a wing-spread of twenty-eight inches. The bat eats a great many insects. One or two young are born, and are carried on the mother's breast until they are quite large. The bat hibernates hanging by one foot. *Pages 154, 155*

Animal Home Builders

Muskrat	FOUND in the temperate parts of the United States and Canada. He eats plant food which grows in and about the marshes in which he lives. The muskrat multiplies very rapidly. The winter home is made of seeds and grasses and is built off-shore, perhaps five feet high, with the exits under water. The colony journeys daily to the shore for food, keeping a lane in the ice thin. The muskrat's fur is dark brown, and is valuable. Muskrat raising is now profitable. *Pages 27, 46-47, 170, 171*
Stickleback	FOUND throughout the northern hemisphere. A small fish, but of great interest because of his domestic habits. The male builds the nest, which looks like a little barrel about an inch in diameter lying sideways. He coaxes one or more females to lay eggs in it, then guards the nest and the young carefully. The mating colors of the male are bright green on the side and red beneath. Fierce battles occur between males in the courting season, late spring. The food consists of small water animals. *Page 257*
Trapdoor Spider	A MEMBER of the Tarantula family found in the warmer parts of North America. The nest, made by the female, is a V-shaped tube in the ground, with two trap doors, one at the entrance to the main hole and the other where the forking takes place. The eggs are laid in this nest. In case of attack and entrance, the trap door leading into the bottom hole is seldom noticed. This spider is dark-colored and hairy. Touch is the main sense organ. He eats insects. *Page 139*
Beaver	FOUND in North America, Europe, and Asia. The beaver shows great intelligence. Not only does he build homes, but he builds them in definite ways for definite uses. He builds dams to keep the entrance of the home under water. He adds little dams to strengthen the main one. When floods come he breaks the dam. He also builds spill-ways and roadways. He stores food for winter. His food consists of bark, bulbs, and water plants. He lives many years. Usually four young are born. The beaver's fur is valuable. *Pages 159-161*
Cliff Swallow	FOUND throughout North America. At one time this member of an interesting home-building family built its nest of mud in colonies along the sides of cliffs. It still does so until forced away by the advance of man, and then it takes to eaves of buildings, often in the heart of a city. The cliff swallow is a friend of man because it eats great numbers of beetles, bugs, mosquitoes, and flying ants taken while flying. Four to six eggs are laid, and there are two sets of eggs each year. *See story of other swallows, pages 301-302*

Animals That Help and Depend Upon One Another

Hermit Crab	AN animal which makes use of another animal. The body of the hermit crab is soft. Needing protection, he slips into an empty whelk or buckie shell which serves as a home. Then he places a sea anemone on the shell. The anemone can sting, and he also helps the crab by forming a mask. The crab carries the anemone from place to place; so both gain something from each other. The hermit crab is common along the Atlantic Coast. The mother lays 12,000 to 15,000 eggs. The young cling to the abdomen. These crabs eat animal and vegetable food. *I, 232*
Fresh-Water Mussel	FOUND in the soft mud of river bottoms. He is from four to six inches long and greenish brown. He is of value for the mother-of-pearl lining of the shells, and for the pearls made within the body. The eggs are formed in summer, but the young are kept in pouches in the mother's gills until the next year. Then the little pinhead larvae of some kinds of mussels are sent out to catch onto the body of a passing minnow, on which they live for a while before settling to the bottom for their adult life.
Sea Cucumber	SO named because the body has the shape of a cucumber. There is an opening at each end, through which the sea water passes all the time. There are feelers around the mouth. The sea cucumber belongs to the " prickly skinned " animals like the starfish. He lives in deep ocean waters and may reach an age of ten years. The larvae, or young, are free-swimming in deep ocean waters. *Fierasfer*, a little fish, must live in a dark place where there is running water, and so he is most happy inside the sea cucumber. *I, 226*
Liver Fluke	A FLAT worm living in the liver of sheep. One produces 500,000 eggs which pass from the sheep's body. Little swimming larvae hatch from the eggs if they are left near water, and must then find a pond snail. In the pond snail, the fluke changes shape, and then leaves the snail and rolls itself up on a grass blade. If the grass is eaten by a sheep, the life story of the fluke is complete. The fluke is leaf-shaped, an inch long, and brown.
White Ant or Termite	NOT an ant, but nearer the dragonfly in kind. He is found in warm countries. In some cases his home is unusual. It is at least a yard high, is strong, and contains rooms, passageways, and staircases. Termites are social. There are the Royal Pair, the Workers, and the Soldiers. The worker is about half an inch long. The termite loves darkness. The queen lays sixty eggs a minute. The termite would starve if he did not have other little animals, protozoa, living in his stomach, to turn the wood which he eats into sugar.

How Some Animals Change Their Appearances

Frog	BELONGS to a group of animals called "amphibians" because they can live either in water or on land, or can pass part of their life in water and part on land. The eggs are laid in a gelatine-like mass in the water, hatching into the larvae, or tadpoles, which have fins and gills. As development goes on, legs appear, and breathing takes place through lungs. The frog eats insects, catching them with a long, folded tongue which is fastened to the front of the lower jaw. The tadpole cannot move his tongue. Some frogs are good to eat. *Pages 23, 241-244; X, 74-76*
Luna Moth	THE beautiful green moth prized by the young collector. There are four separate stages in his life history: egg, larva, pupa, and adult. The larvae, or worms about three inches long, are found on the leaves of walnut, hickory, and other forest trees. The moth is a pale bluish green with a pearl head. The cocoon is usually wrapped in a leaf, and has little silk. The adult has a wing border of brownish purple, and the hind wings are drawn out into a curved swallow tail. Luna moths fly by night. *Page 128*
Dragon Fly	DARNING needle, devil's needle, snake doctor, and spindle are some of the "bad-sounding" names given to this harmless insect. He is of help to us for he eats insects, especially mosquitoes. The young look somewhat like the adult. The eggs are laid in water and hatch into the nymphs which shed the outer skin for the last time after leaving the water for the adult life in the air. The wings have beautiful shining color effects, and the adults are seen darting near water where the eggs are laid.
Eastern Oyster	MOST valuable of the shellfish, giving food and pearls. The biggest beds are in the Chesapeake Bay. There are few natural beds nowadays. The oyster gives out eggs and sperm. The change in form is quite wonderful, for in the early and larval stage the oyster is free-swimming. Later, it becomes fastened and grows a shell. Full growth takes about five years. Some oysters live to be one hundred years old. The oyster breathes with gills. Though the fully grown oysters move very little, the larva is a strong swimmer, using a lash near the mouth. *I, 234-236*
Caecilian Blindworm	AMPHIBIAN of tropical America, Africa, and Asia. He is a blind, limbless, burrowing animal and is different from most amphibians in that he has plates on the outside of the body, as do reptiles. The eggs, about two dozen, are laid in moist earth and guarded by the mother, who coils around them. Gills are found even in the egg stage, although there is no need of them. The larvae crawl to nearby water and there complete the change into the adult form. The general color is olive brown to black.

Some Animal Friends and Foes to Man

Sheep	SHEEP have been, for thousands of years, of the greatest use to man. The flesh is used for food, the hair for woolen cloth, and the horns for many purposes. The chief wool maker is the Merino. He can be raised in the temperate parts of the world. Some wild sheep live in mountains and cold parts of the earth. The sheep eats grasses and chews a cud. After the food is hastily swallowed, it is brought again to the mouth and chewed. One or two lambs are born. *Page 195*
Clothes Moth	THERE are several kinds of clothes moths, but the common one is brown colored and about half an inch long. The eggs are laid in the summer in clothing, furs, curtains, etc. The caterpillar makes a case for itself out of the hair or fur. It lives in this, eating the cloth and fur to enlarge the home until it flies away, an adult, to lay more eggs. The adult does not like the smell of camphor, and the eggs can be destroyed by brushing the garments or by placing them in cold temperatures. *Page 127*
Bob white or Quail	FOUND in Eastern North America. Their feathers of browns and grays blend so well with the landscape that hunters almost step on the birds before seeing them. The ten to twenty eggs are laid in a shallow spot made in the leaves by the mother's breast. The young are covered with down at birth, and can almost immediately run about. The bob white eats seeds, weeds such as ragweed and pigweed, hemp, mullein, and wild grasses, which are harmful to man's interests. He also eats harmful insects. *Pages 329, 330*
Earth-worm	A TRUE worm (which caterpillars, and so forth, are not), for he does not change into another form. This lowly animal is our natural farmer. The whole top of a rich stretch of soil will pass through the bodies of earth worms every few years. He lives in holes three to eight feet deep. Water, air, and the roots of plants can enter these holes. The eggs are little cases of the size of mustard seeds, and can be found in June near the openings of the holes. He is a night-loving animal.
Mackerel	FOUND in the open seas of the North Atlantic during the greater part of the year, but comes close to shore to lay eggs. They become adult in about four years. The mackerel is one of the most important food fishes of Europe and America. He is eighteen inches long when full grown, green above, with dark blue bars and silver beneath. The tail fin is very powerful, and he is one of the fastest swimmers. His natural enemy is the dogfish. The mackerel is a careful eater, feeding on tiny plants and animals.

Migration of Animals

Northern Fur Seal	KNOWN also as "sea bear," found in the Bering Sea, the St. Paul, and near islands between the north of Asia and America. He eats fish. The seal homes are made on the shores of the St. Paul. They are guarded by males who may have as many as forty females kept in captivity until after the mating season in June or July. Then young and elders migrate south for the winter. Seals are valuable because of the seal skin which is taken from the under side of the animal. *Pages 232, 233; I, 252*
Reindeer	FOUND in the cold northern parts of Europe and Asia. He eats mosses and lichens. There is one young born at a time. The winter coat is white, which makes it more difficult for his enemies to see him. These animals are the chief wealth of the Laplanders who secure milk, flesh, and clothing from them. They are also used to pull loads across the snow. The Laplanders migrate with the reindeer in search of fresh pasture. During the migrations the herds mix with the wild reindeer. *Pages 193, 194*
The Arctic Tern	WINTERS in the Antarctic during the long Antarctic day, and nests during our summer in the Arctic. It is noted for its long flight during the long Arctic day. Two or three eggs are laid in a hollow in sand or pebbles or in a nest made of a few blades of grass. The young when hatched are covered with down, and can leave the nest within a few hours. The tern feeds largely on fish. It dives into the water for food, while gulls just skim the surface. The bright red bill points downward. Terns have been killed in large numbers for their feathers. *X, 292-295*
American Buffalo or Bison	ROAMS in Northwestern Canada and in the National Parks of the United States. Bison were killed by the Western settlers, beginning about 1871, until they were fast disappearing. Now game laws protect the slowly increasing population. They live on plants. Until they were slaughtered by white men, they moved in great herds under the command of a leader. If the leader was killed, they ran in circles and were easily killed. The bison has a brown back. The head and front parts are amber. He lives about twelve years. One young is born at a time. *Page 199; X, 123*
Pacific Salmon	FOUND in the North Pacific Ocean. Salmon means "leaper." They migrate from the salt water of the ocean to fresh water streams for egg laying. They do not feed during the migration. In these trips they have been known to leap falls ten feet high. Many of them probably die after the egg-laying, or spawning, is over. The young descend the stream to the salt water. After the young have become fully grown, they, too, migrate up the streams. The salmon is of great value for food. *X, 114*

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